



VOLUME 2

Artificial Intelligence

2023 AI&ML DEPARTMENT



AS



Artificial Intelligence and Machine Learning Department



"To become a department of international relevance in the field of Artificial Intelligence and Machine learning"

Mission

"To nurture students with sound engineering knowledge in the field of AIML through effective use of modern tools with a focus on imbibing professionalism, leadership qualities, ethical attitude, lifelong learning and social sensitivity."



Programme Educational Objectives (PEOs)

PEOs: Ability to contribute to problem identification, analysis, design, and development of systems using principles and concepts of Artificial Intelligence and Machine Learning.

02

PEOs: Ability to apply the concepts, principles and practices of Artificial Intelligence and Machine Learning and critically evaluate the results with proper arguments, selection of tools and techniques when subjected to loosely defined scenarios.

PEOs: Use Artificial Intelligence and Machine Learning models on data for enabling better decision making. 03

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Program Outcomes (POs)

PO 1: ENGINEERING KNOWLEDGE: Apply Knowledge of Mathematics, Science, engineering fundamentals and an engineering specialization to the solution of complex.

PO 2 : PROBLEM ANALYSIS: Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PO 3 : DESIGN / DEVELOPMENT OF SOLUTIONS: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations

> PO 4 : CONDUCT INVESTIGATIONS OF COMPLEX PROBLEMS: Using research based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions



Program Outcomes (POs)

PO 5: MODERN TOOL USAGE: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

> PO 6 : THE ENGINEER AND SOCIETY: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

PO 7: ENVIRONMENT AND SUSTAINABILITY: Understand the impact of professional engineering solutions societal in and environmental context and demonstrate knowledge need for sustainable of and development.

PO 8: ETHICS: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.



Program Outcomes (POs)

PO 9: INDIVIDUAL AND TEAM WORK: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

PO 10: COMMUNICATION: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

PO 11: LIFE-LONG LEARNING: Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

> PO 12 : PROJECT MANAGEMENT & FINANCE: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects in multidisciplinary environments.



Programme Specific Outcomes (PSOs)

PSO 1: Ability to contribute to problem identification, analysis, design, and development of systems using principles and concepts of Artificial Intelligence and Machine Learning.

02

PSO 2: Ability to apply the concepts, principles practices and of **Artificial** Intelligence and Machine Learning and critically evaluate the results with proper arguments, selection of tools and techniques when subjected to looselv defined scenarios.

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03

PSO 3: Ability to use Artificial Intelligence and Machine Learning models on data for enabling better decision making.







MESSAGES





Dr. Megharani Patil

Incharge Head of Department - AI&ML

The aim of education is to instill discipline, cultivate trust, and facilitate personal growth at all levels. By combining diligent effort with knowledge and interaction, individuals can achieve the success they desire. Our magazine's vision is to provide high-quality education across all core disciplines by empowering students to develop in all areas.

Our second edition of the TEJAS magazine focuses on the fascinating field of Artificial Intelligence. It provides an exceptional platform for students to showcase their research and share their innovative ideas with others. The articles showcased in this edition offer captivating insights into different aspects of AI, enabling students to develop a diverse set of competencies.

Our magazine inspires students to aim for greater heights in their academic pursuits, instilling the value of lifelong learning and contributing towards society's progress through the transformative potential of AI. We believe that readers will appreciate the message conveyed in this edition and acknowledge the hard work put into its production.

Finally, I would like to congratulate the committee, students, and faculty for their exceptional contributions, valuable time, and dedication for this edition of TEJAS Magazine.

-Dr. Megharani Patil Incharge Head of department



Mr.Anand A. Maha

Faculty Incharge

It gives me immense pleasure to present the second issue of our technical magazine TEJAS. This issue is centered around the fascinating and transformative field of Artificial Intelligence, which is rapidly becoming a driving force in many aspects of modern life.

The articles in this edition are thought-provoking and informative, providing a captivating insight into various aspects of AI. They have been written with great enthusiasm and passion by our talented students, who have honed their research, writing, and analytical skills in the process.

This edition of Tejas has set the bar even higher, featuring technical papers that delve deeper into the complex world of AI. Such research and development are essential in expanding our understanding of this exciting field and helping us realize its full potential.

In conclusion, I would like to wish the editorial team, contributors, and the entire department all the best for future editions of Tejas. May this magazine continue to inspire, educate, and empower our students to strive for excellence in their academic pursuits and contribute towards the betterment of society.

> -Mr.Anand A. Maha Faculty Incharge



FACULTY ARTICLE



CHALLENGES AND OPPORTUNITIES : blockchain technology PRESENTS IN THE LEGAL INDUSTRY

The legal industry faces both challenges and opportunities with the adoption of blockchain technology. The legal validity of smart contracts is a major challenge due to the lack of enforceability in all jurisdictions. Regulatory clarity is lacking, creating uncertainty for businesses that want to implement blockchain technology. Blockchain's transparent nature raises concerns about privacy for sensitive legal information.

Interoperability issues exist between different blockchain networks that make it difficult for widespread adoption. Scalability is a challenge, making it hard to scale for large-scale legal applications. Integration with existing systems can be difficult, as not all legal organizations have compatible systems and processes.

Intellectual protection property can be challenging due to the open and transparent nature of blockchain technology. Education and training are necessary to help legal professionals understand and utilize blockchain technology. Cybersecurity risks exist, even though blockchain technology is designed to be secure. Cost can be a barrier for small legal organizations due the expense of to implementing blockchain technology.





transparency and reduce Decentralized crowdfunding platforms can be created to fund legal cases and other legal initiatives. Legal data management can be improved with blockchain technology to securely manage and store legal data.

Digital notarization services can be created with blockchain technology for more efficient and secure notarization processes. Public registries, such as land and corporate

registries, can be created to increase

fraud.

Blockchain technology can streamline contract management with self-executing and enforceable smart contracts. Intellectual property management can be improved with blockchain technology to manage and protect trademarks, patents, and copyrights. Tamper-proof legal documentation, such as wills, trusts, and deeds, can be created with blockchain technology. Decentralized dispute resolution mechanisms can be more efficient and cost-effective than traditional legal verification systems. Identity can be improved with blockchain technology to reduce fraud and increase accuracy. Supply chain management can be improved by tracking the provenance and ownership of goods.



~JAGRUTI JADHAV FACULTY AI&ML

NANOTECHNOLOGY WITH AI





Fig.1 Nanotech plus Al

The debate about 'converging technologies' is part of a more comprehensive technical discourse on nanotechnology, biotechnology, information and communications technology (ICT), brain research, artificial intelligence (AI), robotics, and the sciences that deal with these topics. Convergence is an umbrella term for predictions ranging from an increase in synergetic effects to a merging of these fields. Artificial intelligence (AI) and nanotechnology are among the most hyped emerging technologies today. But in many ways, they are also the least understood.

In this article, we want to get beyond the hype. we'll look at real-world, actually-existing situations in which AI and nanotech are already being used. And by doing that, we'll immediately see that there is a natural overlap between the technologies, and one that can drive the development of both.

How Can Applications of AI Enhance Nanotech?

While such a vision is still in the future, technology today have begun to exhibit similar synchronisation in their abilities to work with each other, especially when it comes to AI and nanotech.

The concept of nanotechnology is clear, but the execution can get tricky. First of all, operating at an atomic level is much more challenging than conventional operating. Laws of physics are different, and tiny mistakes can have a disastrous impact. The environment influences the accuracy of the result and introduces error rates. It's crucial to use the right tools for the best result in a surrounding such as a fragile human body. Of course, we are talking about machine learning algorithms. If the link between current artificial intelligence and nanosciences is bridged then it is capable of boosting research in these disciplines and offering communication technologies and information to the new generation which will impact our society on a large scale, and possibly will provide the means for the merging of biology and technology. Alongside this, tools have been used by different efforts from artificial intelligence in basic and applied nanoscience research, for instance, for interpreting the experimental techniques or for

helping in the structural design of devices and nanomaterials.(Fig.1)

Scanning Probe Microscopy (SPM) is one of the most usually used methods for nanoworld imaging. Any image obtaining technique from the interaction between a sample and a probe is involved in this broad concept. Many methods have been developed based on the interaction's nature. Many of the modern SPM's main components are possessed by instruments such as the topografiner. In 1981, the firstly developed technique was Scanning SPM Tunnelina Microscope. Sample topography characterization with the microscope is allowed by the interaction between the sample and the probe which is the tunneling current. When the interaction between the sample and the tip changed, various methods were designed in the following years of the nanoscope's discovery.

Atomic Force Microscopy (AFM), Scanning Near-Field Optical Microscopy (SNOM), and Scanning Capacitance Microscopy (SCM) are some characteristic examples. Contact mode was the first mode that was used for scanning the sample's surface in the AFMs case. Other commonly used examples of interactions for mapping surfaces at the nanoscale are the electrostatic force and the magnetic force. Also, for manipulation on the atomic scale, SPM became an effective tool.

Due to the scale of research undertaken when dealing with nanoparticles, it is difficult to quantify some of the variables in the setting, as they cannot be recorded. Moreover, interpreting these results is also a behemoth task, owing to the same reasons. However, AI is a perfect fit for these tasks, as it can not only optimise the data and algorithm design for the technology, but also estimate multiple parameters and interpret results from experiments.

Nanotechnology can also enable the transformation of stem cells to bone cells on command, thus providing a solution for multiple diseases. The manipulation of stem cells by Al can

Nanotechnology can also enable the transformation of stem cells to bone cells on command, thus providing a solution for multiple diseases. The manipulation of stem cells by AI can also result in the creation of human organs for the replacement and repair of damaged ones. Guided by the AI, the nanobots can generate an organ from stem cells.

By utilising an AI, nanobots can also differentiate between good and bad cells, something that cancer researchers have been trying to determine for many years. Moreover, nanobots can also rely on unsupervised machine learning to help them make these decisions.(Fig.2)



Fig.2 Nanobots

It is true that the adoption of AI with nanotechnology has not been as widespread as other scientific industries, however, nanotechnology often requires more complex systems that are not always compatible with some aspects of AI (or it makes it harder to implement). That being said, there are some developing areas where AI converges with nanotechnology.



STUDENT ARTICLE



Artifical Intelligence in Blockchain

Artificial intelligence (AI) and blockchain technology are two of the newest technologies to emerge over the past decade. While artificial intelligence allows machines to assist humans in making decisions, blockchain technology is a distributed ledger that makes it secure, transparent and unproven. The combination of artificial intelligence and blockchain technology can bring new value to business processes that involve multiple parties, eliminating friction, increasing speed improving performance. and While AI algorithms can be used to process and analyse data, automate processes and create smart contracts, blockchain technology provides a secure and transparent way to store and distribute the AI model.

While one of the main concerns of blockchain is security, intelligence creates interpretation and trust issues in AI-based decisions and predictions.

Blockchain can provide transparency, privacy, and trust for AI-based applications, while AI can increase reliability and security while increasing trust in trusted data and AI recommendations. Blockchain digital data provides insight into the framework behind AI and the data sources it uses, and addresses the challenge of explaining AI. This helps increase confidence in data integrity, which increases confidence in AI's recommendations. Using blockchain to store and distribute AI models also helps ensure their authenticity and prevent tampering. There are many practical scenarios for linking The financial services industry uses artificial intelligence and blockchain technology to create more efficient and secure payments. Artificial intelligence can be used to detect fraud and patterns, while block chain technology can be used to ensure the security and integrity of transactions. In supply chain management, blockchain technology can be used to create a transparent and secure supply chain, while artificial intelligence is used to analyse data and optimize the supply chain. This can help businesses reduce costs, increase efficiency and ensure products are delivered on time and efficiently.

The combination of AI and blockchain has the potential to create new business models from their advantages.



Al and blockchain technology complement each other, allowing for efficient, secure and transparent operations. The combination of artificial intelligence and blockchain technology can lead to efficiency, security and transparency. In contrast, both AI and blockchain have their own differences and complexities. The benefits of this combination are enormous, although there are still issues to be resolved, such as AI's lack of explanation and blockchain's scalability. The combination of artificial intelligence and blockchain technology has the potential to create powerful new solutions that increase efficiency, transparency and trust across the business.

The integration of artificial intelligence and blockchain technology can change the way people do business by providing more efficient, secure and transparent solutions. The combination of artificial intelligence and blockchain technology can bring new value to business processes that involve multiple parties, eliminating friction, increasing speed and improving performance.

The potential applications for the combination of blockchain and AI are vast, including financial services, supply chain management, healthcare, and social analytics. Although there are still problems to be solved, the advantages of this combination are huge and it will be interesting to see how they can be used together to create new solutions and change the existing business.



~Arpitshivam Pandey TT. Al&ML

AI-based Cybersecurity

As technology advances at an unprecedented pace, the world has become more reliant on the internet for communication, business, and personal purposes. This has led to an increase in the amount of sensitive data stored and transmitted over the internet, which in turn has made cybersecurity more critical than ever before. Cybersecurity involves protecting networks, systems, and sensitive data from unauthorized access, theft, damage. or disruption. To keep up with the ever-increasing threat of cyberattacks, organizations have cybersecurity adopting AI-based started systems.

Artificial Intelligence (AI) is an emerging technology that has been increasingly applied to cybersecurity over the past few years. AI has proven to be an effective tool for detecting and mitigating cyberattacks, and it can help organizations identify and respond to potential threats in real-time.

Al-based cybersecurity involves the use of machine learning algorithms, neural networks, and natural language processing to analyze data and detect patterns of suspicious behavior. Al-based systems can monitor networks and devices, detect anomalies, and alert security personnel in real-time.

One of the most significant benefits of AI-based cybersecurity is that it can quickly adapt to new threats and attack methods. Traditional cybersecurity solutions rely on known threats and patterns of attacks, but AI-based systems can learn and detect new threats as they emerge. This is because AI systems are designed to learn from data, and they can continuously improve their detection capabilities as they process more information. Another advantage of AI-based cybersecurity is that it can reduce the workload of security personnel. By automating routine tasks such as threat detection, AI systems can free up security personnel to focus on more complex and critical tasks such as incident response and threat hunting. This can help organizations save time and resources, and also reduce the risk of human error.

AI-based cybersecurity can also help organizations to better understand their cybersecurity risks. By analyzing data on past cyberattacks, AI systems can identify weaknesses in the organization's security posture and provide recommendations on how to improve security. This can help organizations to proactively address security gaps and reduce the likelihood of successful cyberattacks.



However, AI-based cybersecurity also poses some challenges. One of the main challenges is the potential for false positives or false negatives. False positives occur when the system detects a threat that is not actually present, while false negatives occur when the system fails to detect a real threat. Both of these can lead to wasted time and resources, and can also create security vulnerabilities if real threats are not detected.

Another challenge is the potential for Al systems to be manipulated by attackers. Adversaries can use various techniques such as data poisoning or adversarial machine learning to trick Al systems into making incorrect decisions. This can lead to the system failing to detect real threats or misclassifying benign activity as malicious.

To mitigate these challenges, organizations should implement a multi-layered approach to cybersecurity that includes both AI-based systems and human expertise. AI-based systems can detect threats and provide realtime alerts, but human analysts should be involved in reviewing and responding to those alerts. Organizations should also regularly test and update their AI-based cybersecurity systems to ensure they remain effective against evolving threats

Explainability: One challenge with AI-based cybersecurity is the lack of explainability. In other words, it can be difficult to understand how an AI system arrived at a particular decision or alert. This can make it difficult for human analysts to verify the accuracy of the system's output. To address this, organizations should prioritize the use of AI systems that provide clear explanations of their decision-making processes.

Privacy: AI-based cybersecurity systems often rely on the analysis of large amounts of data, including personal and sensitive information. It is important for organizations to ensure that their AI systems are designed with privacy in mind, and that they comply with applicable data protection regulations. Ethical considerations: AI-based cybersecurity raises a number of ethical considerations, such as bias and discrimination. For example, if an AI system is trained on data that reflects existing biases (e.g. gender or racial bias), it may perpetuate those biases in its decisionmaking. Organizations should prioritize the ethical use of AI systems and ensure that they are designed and implemented in a responsible manner.

Integration with other cybersecurity tools: Albased cybersecurity systems should be integrated with other cybersecurity tools, such as firewalls and intrusion detection systems, to provide a more comprehensive security posture. This can help to reduce the risk of cyberattacks and minimize the impact of successful attacks.

Training and education: As with anv cybersecurity solution, the effectiveness of AIbased cybersecurity depends on the knowledge and expertise of the individuals who use it. Organizations should invest in training and education for their security personnel to ensure that they have the skills and knowledge needed to effectively use and manage AI-based cybersecurity systems.

Overall, AI-based cybersecurity offers many potential benefits for organizations looking to enhance their cybersecurity posture. However, it is important to approach AI-based cybersecurity with a clear understanding of its potential limitations and challenges, and to prioritize responsible and ethical use of these systems.

In conclusion, AI-based cybersecurity has the revolutionize potential to the wav organizations detect and respond to cyber threats. By leveraging machine learning and other AI techniques, organizations can detect threats in real-time, reduce the workload of security personnel, and proactively address security gaps. However, organizations must also be aware of the potential challenges and limitations of AI-based cybersecurity and implement a multi-layered approach that combines AI with human expertise to ensure the best possible outcomes.

Deep Learning

Deep learning is a subfield of machine learning that uses artificial neural networks to model and solve complex problems. In recent years, deep learning has shown remarkable success in various applications such as image recognition, natural language processing, speech recognition, and self-driving cars. This paper provides an overview of deep learning, its applications, and some of the recent advancements in the field.

Deep learning is a type of machine learning that is based on artificial neural networks. It involves building models that can learn to recognize patterns and make decisions based on data. Deep learning algorithms are designed to automatically extract features from raw data, which makes them very powerful for solving complex problems. In recent years, deep learning has shown remarkable success in various applications such as image recognition, natural language processing, speech recognition, and selfdriving cars. Deep learning has numerous applications in various fields. Some of the most common applications of deep learning are:

1. Image Recognition: Deep learning algorithms are used to recognize objects in images and videos. This technology is used in autonomous vehicles, security systems, and medical imaging.

2. Natural Language Processing: Deep learning is used to analyse text and speech data, which is useful for applications such as speech recognition, language translation, and chatbots.

3. Speech Recognition: Deep learning algorithms are used to recognize speech and convert it into text. This technology is used in virtual assistants, dictation software, and automated call centres.

4. Self-Driving Cars: Deep learning algorithms are used to help autonomous vehicles navigate and make decisions based on their surroundings.





Recent advancements in deep learning have led to significant improvements in performance and accuracy. Some of the most notable advancements in the field include:

1. Generative Adversarial Networks (GANs): GANs are deep learning models that can generate new data based on existing data. This technology is useful for applications such as image and video generation.

2. Reinforcement Learning: Reinforcement learning is a type of deep learning that involves training models to make decisions based on rewards and penalties. This technology is used in applications such as game playing and robotics.

3. Transfer Learning: Transfer learning is a technique that allows deep learning models to use knowledge from one domain to solve problems in another domain. This technology is useful for applications such as image recognition and natural language processing.

Deep learning is a rapidly evolving field that has shown remarkable success in various applications. The advancements in deep learning have led to significant improvements in performance and accuracy, and it is expected to continue to grow and evolve in the future. Deep learning has the potential to revolutionize various industries and make our lives easier and more convenient

> ~Aakash Maurya TT. Al&ML



AI in Healthcare

In many respects, ArOficial Intelligence (AI) is changing the healthcare sector. lt is transforming how medical praceeoners idenOfy, manage, and prevent illnesses, improving access to and cost of healthcare. An overview of AI's applicaOons in healthcare is provided below:

1. Medical imaging: AI is being uOlized in the field of medical imaging to analyzing pictures from X-rays, MRIs, and CT scans, allowing for a quicker and more precise diagnosis of illnesses. AI systems, for instance, can idenOfy stroke symptoms in brain scans and abnormaliOes in breast mammography.

2. Personalized Medicine: AI is making personalized treatment possible by analyzing vast volumes of pa0ent data and seeing trends that might foretell a paOent's propensity to get specific diseases. This enables medical providers to customize therapies for specific individuals and enhance outcomes.

3. TherapeuOc discovery: By analyzing enormous volumes of data and finding possible therapeuOc targets, AI is being used to speed up the process of discovering new drugs. This can help innovaOve pharmaceuOcals reach the market more rapidly and at a substanOally lower cost and Ome investment.

4. Virtual Assistants: Al-driven virtual assistants are being u Θ lized to offer pa Θ ents individualized healthcare guidance and support. Chatbots, for instance, might advise pa Θ ents on when to seek medical a Σ en Θ on and respond to queries from pa Θ ents about symptoms.

5. Electronic Health Records (EHR): Electronic health records: ArOficial intelligence (AI) is being used to examine electronic health informaOon and find possible health hazards for paOents. This enables medical pracOOoners to take acOon before a paOent's condiOon deteriorates.

Currently, AI is being used in the following domains of Healthcare: Radiology and medical imaging: ArOficial intelligence (AI) is being used to analyze medical pictures like X-rays, MRIs, and CT scans, assisOng radiologists in idenOfying anomalies and spotng illnesses like cancer. For instance, mammograms may accurately idenOfy breast cancer when using AI algorithms. AI is being used to analyze paOent data and make prediceons about outcomes, such as the possibility that a paOent would contract a certain disease or the likelihood that they will need to be readmi Σ ed to the hospital. Healthcare professionals can use this informa0on to take early ac0on and stop negaOve effects. Chatbots and Virtual Assistants: AI-powered chatbots and virtual assistants are being uolized to aid people in accessing healthcare faciliOes, give basic healthcare advice, and respond to medical queries.

These resources can increase pa0ent involvement and aid healthcare professionals in providing care more effecOvely. In conclusion, AI is significantly changing the healthcare sector in a variety of ways, including by enhancing diagnosis, creaOng individualized treatment plans, and increasing access to and affordability of healthcare. The advantages of AI in healthcare are obvious, despite certain obstacles to be solved, such as protecOng data privacy and eliminaOng algorithmic biases. AI has the potenOal to transform healthcare, enhancing paOent outcomes and altering how healthcare is provided globally with sustained innovaOon and investment. As a result, as we conOnue to invesOgate the potenOal applicaOons of AI in healthcare, it is an exciOng moment for healthcare professionals, researchers, and pa0ents alike



~Rohit Gupta TT. AI&ML.



Deep Reinforcement Learning and Gaming

A subset of machine learning (ML) known as deep reinforcement learning (DRL) combines deep learning methods with reinforcement learning (RL). DRL makes it possible for robots to learn from their failures and make decisions in real-time to accomplish a specified goal, like winning a game or traversing an environment. A DRL agent interacts with the environment and, depending on the actions it performs, it receives feedback in the form of rewards or penalties. The agent learns by adjusting its behavior to maximize the total reward it receives over time. The core concept of DRL is to approximate the value function or policy function that links states to actions using deep neural networks. DRL is capable of handling dynamic and complex contexts where there is no predetermined best solution. Thus, the DRL is suited for real-time decision-making tasks since it can adapt to changing circumstances and gain knowledge from experience.



The early video games were straightforward 2D games with simple graphics and sound effects. The complexity of games increased along with the quality of their graphics, sound effects, and gameplay as technology advanced. The most recent advancement in gaming, Deep Reinforcement Learning (DRL), has completely changed how games are created and enjoyed.

- 1950s 1960s: The earliest games were textbased, mainframe computer games like tictac-toe and chess that were developed in the 1950s and 1960s.
- 1970s: The first arcade games, including Pong and Space Invaders, were developed in the 1970s. These video games utilized simple visual and musical effects and were played on special machines
- 1980s: Home consoles like the Atari 2600 and the Nintendo Entertainment System (NES) became popular in the 1980s. These systems offered improved graphics and more intricate gaming mechanisms, allowing users to play video games at home.
- 1990s 2000s: The development of 3D graphics during the 1990s and 2000s allowed games like World of Warcraft and the GTA Series to have more life-like settings and characters.





• 2010s: The 2010s saw a rise in the popularity of artificial intelligence (AI) and machine learning (ML) approaches in gaming. AI was utilized in games like F.E.A.R. and Black Ops II to make more realistic enemies, and ML was applied in games like Civilization VI to enhance gameplay dynamics.

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• 2020s: The way that games are now produced and played has been revolutionized by the use of DRL in gaming. DRL gives programmers the ability to design AI agents that can learn from experience and make the best decisions at the moment to accomplish a certain goal, like winning a game or finishing a level. Games like AlphaGo and Dota 2 have shown off the effectiveness of DRL in generating difficult and interesting gameplay.



Deep Reinforcement Learning (DRL), which has been used to create AI agents that can play video games at a superhuman level, has attracted a lot of attention in the gaming industry. In games with complex and dynamic situations, where traditional AI techniques like rule-based or programmed approaches fall short of delivering adequate results, DRL is very helpful. To accomplish a certain goal, like winning a game or finishing a level, DRL can help agents learn from their mistakes and create strategies that can adapt to various game scenarios and opponents in real-time. In game development using DRL a variety of gaming environments are been made available to the agent. Playing the game and getting feedback on its actions, such as rewards or penalties, helps the agent learn. The agent modifies its decision-making process in response to the feedback to enhance its performance in the game. Thus, DRL can help game developers create more challenging and engaging games that provide players with а more personalized experience

• AlphaGo (Google Project):

One of the most well-known instances of DRL in gaming is AlphaGo, a Google DeepMind AI agent that defeated the Go world champion in 2016. AlphaGo was taught utilizing supervised learning and DRL methods, playing countless games against itself to discover the best tactics.

• Dota 2 (OpenAl Project):

Another example of DRL in gaming is the Dota 2 Al from OpenAl, which in 2017 and 2018 defeated expert human players in a 1v1 match and a 5v5 match. Combining supervised learning, reinforcement learning, and self-play strategies, the Dota 2 Al was developed.

As a result, the DRL has changed the way games are planned and played by enabling the development of more demanding, interesting, and personalized games that provide players with a more immersive and realistic gaming experience

> ~Shreyash Salunke TT. AI&ML

Machine Learning in Blockchain

The utilization of blockchain technology has surged in popularity owing to its ability to provide secure and transparent systems, while machine learning has been making significant strides in the technological landscape with diverse applications across industries. Merging machine learning with blockchain technology has produced a new approach to address complex challenges in various industries.

By leveraging machine learning algorithms to learn from data and solve specific problems and blockchain technology's immutable ledger of transactions that guarantee data integrity, a powerful platform is created to provide secure and efficient solutions to complex issues in different sectors.

One of the areas where machine learning and blockchain technology have been integrated is in the development of smart contracts. Smart contracts are automated self-executing contracts written into code and stored on the blockchain, and they execute automatically based on predefined conditions. Machine learning algorithms can analyze data and identify patterns, leading to the development of more intelligent and secure smart contracts that can be applied in industries like finance and insurance.

Moreover, machine learning can help identify and prevent fraudulent activities in blockchain technology. Despite blockchain's transparency and security, it is not entirely immune to fraudulent activities. Machine learning algorithms can analyze data, recognize patterns indicative of fraudulent activities, and develop algorithms that can detect and prevent fraud in real-time, enhancing the safety of blockchain technology. Integrating machine learning with blockchain technology can also lead to the development of predictive models. By leveraging machine learning algorithms to analyze data from the blockchain and identify patterns, predictive models can be developed to predict future events in sectors like finance and insurance. This will enable investors to make informed decisions based on predictions of future market trends.

In conclusion, the merger of machine learning and blockchain technology can produce secure and efficient solutions to complex problems in diverse industries. The development of intelligent smart contracts, identification and prevention of fraudulent activities, and the creation of predictive models are some of the ways this integration can be utilized. As more companies adopt blockchain technology, the integration of machine learning will become more widespread, leading to new innovative solutions across various industries. This combination has the potential to revolutionize how we approach problem-solving in different fields, and it will be fascinating to see its continued evolution and impact on the industry.

> ~ Aryan Singh TT. AI&ML

Deep-Learning

A subtype of artificial intelligence called "deep learning" can mimic the way the human brain completes difficult tasks. Deep neural networks, which are modelled after the interconnected layers of neurons within the brain, are used in this method of learning from data. It has been successfully used in a variety of domains, including robotics, natural language processing, and image identification.

Deep learning is special in that it can process and interpret huge volumes of data. It operates by feeding a neural network massive amounts of data to train it to learn and detect patterns. Millions of calculations and modifications are made during this process as the network learns to spot patterns in the data.

Deep learning has a major application in picture recognition. Deep learning systems are remarkably accurate in identifying objects in photos. For instance, a sophisticated deep learning algorithm can tell different dog breeds apart, even if they are the same size or colour. Deep learning algorithms are taught on enormous datasets including millions of labelled images, which makes this possible.





Natural language processing (NLP) is another field where deep learning has showed tremendous potential. NLP is the study of how computers and human languages interact. Vast amounts of text data can be used to train deep learning algorithms so they can learn to recognise linguistic nuances and patterns. This has made it possible to create chatbots and virtual assistants that can comprehend natural language and respond intelligently.

Self-driving cars have also made use of deep learning. In order to observe their surroundings and make judgements based on that information, self-driving cars employ sensors and cameras. Real-time data processing by deep learning algorithms enables the car to recognise objects and take appropriate action. Deep learning algorithms do face some difficulties, though. They need a lot of data, which can be expensive and challenging to get. Deep learning algorithms might demand a lot of computer resources to run and train, necessitating specialised hardware or cloud computing services.

The future of machine learning is a topic of much discussion because to deep learning. Technology is developing quickly, which causes both worry and enthusiasm. While most people are familiar with machine learning and artificial intelligence, deep learning is the "new kid around the block" in IT circles and is accompanied by both enthusiasm and fear.

When artificial neural networks learn from substantial amounts of data, the process is known as deep learning, also referred to as neural organised learning. Deep learning algorithms repeatedly complete tasks, making adjustments to the results each time. Large volumes of data are required by the algorithms to facilitate "learning." Deep learning is made feasible by the amazing amount of data that is produced each day, which according to current estimates amounts to 1.145 trillion MB [1]. The rise in deep learning skills is being driven by the enormous increase in data generation. Although deep learning can seem mysterious, the majority of us actually use deep learning techniques on a daily basis.



Virtual Assisant

Use Alexa, Cortana, or Siri yourself? Popular virtual assistants employ deep learning to comprehend the words and phrases people use to communicate with them. They improve their ability to provide the necessary information as a result.

Self-driving cars

Our roads already have autonomous vehicles. In order to respond appropriately, deep learning algorithms assist identify whether an object in the road is a paper bag, another car, or a child.

Chatbots

Chatbots have become more common and can be found on numerous frequently visited websites. Deep learning-based chatbots are increasingly capable of providing intelligent answers to a wide range of queries. Deep learning can generate the necessary results more quickly the larger the data pool from which it is conducted.

In conclusion, by enabling machines to learn from big datasets, recognise patterns, and make judgements appropriately, deep learning has opened up new possibilities in artificial intelligence. Its uses can be found in a wide range of industries, including as robots, natural language processing, and image identification. Deep learning is likely to become more important in our lives as hardware and algorithms continue to advance.illustrations of deep learning

> ~Sarvesh kumar Yadav TT. Al&ML

Artificial Intelligence in India's Military Sector



Artificial Intelligence (AI) is a computer or computer-based robot that can think intelligently and act like a human. The term is used to refer to machines that mimic human intelligence and behaviour and whose tasks are performed by. Artificial intelligence machines can think, learn, solve problems and make decisions. Artificial intelligence feeds information to the machine and allows it to react accordingly up to states.

Artificial intelligence can be divided into weak and strong groups. Narrow AI, video games and Alexa, Siri etc. designed to perform a specific task, such as assistants. AI power acts like a human. It is designed to manage situations without human intervention such as driverless cars and the like. Today the world is witnessing the Fourth Industrial Revolution (4IR) and knowledge is a product of the 4th Industrial Revolution. The term artificial intelligence was coined by the American computer scientist John McCarthy at the Dartmouth Conference (1956), the first conference on artificial intelligence. As we enter the 21st century, artificial intelligence has become an important part of business technology. It affects all aspects of health, education, finance, commerce, and production. Aerospace, mining, transportation, defence industry, etc.

AI plays an important role in ensuring national security. Now, it has become an essential part of thewar today. Artificial intelligence is deployed in all military operations: -

- 1. Training: Simulation and training using software engineering and techniques designed to build models. This model trains soldiers to use combat techniques in real military operations.
- 2. Weapons and ammunition: AI technology is incorporated into modern weapons and munitions used on land, sea, aircraft, and space platforms.AI weapons are very good at war. Integrating the AI into weapons improves combat performance while requiring less maintenance. AI-enabled weapons can very easily call the firing range without human intervention.
- 3. Surveillance: Artificial intelligence technology increases the accuracy of surveillance. The geospatial-analysed AI enables Experts to understand potential projects and extract important information from complex areas. Artificial intelligence in the surveillance system helps detect the target location.
- 4. Combat: AI integrated Robotic Surgical System (RSS) and Robotic Ground Platform (RGP), can provide surgical assistance and evacuation in combat zones. These systems have been trained 4,444 times to recognize patients' medical records and health concerns.
- 5. Data Processing: AI is useful to process large amount of data to extract useful information, AI collects data from various sources and establishes military operational relationship.
- 6.Transportation: Military activity also includes transportation, ammunition, weapons, and soldiers. The integration of AI into military transport reduces human labour and lowers transport costs.
- 7.Drone Control: AI technology can help unmanned aerial vehicles take off and land without human control of.
- 8. Cyber Security: Cyber threats are a threat to the military. A cyberattack can cause the loss of important military information and pose a threat to national security.AI-powered systems can collect cyberattack patterns and develop countermeasures to deal with them. Thus, an AI-enabled cybersecurity system can protect networks, computers and data from unauthorized access.



India lags behind many countries in the use of artificial intelligence in defence. But now India is trying to use AI in the military. The Army, Naval and Defence Research and Development Organization (DRDO) states that AI is used in decision making, surveillance, weaponry weapons, etc. The Indian government has directed NITI Aayog in the 2018-2019 budget to establish the National Artificial Intelligence Program and announce funding for the artificial intelligence, Machine Learning Robotics, and IoT (Internet of Things) sectors.

At Def Expo 2018, Prime Minister Narendra Modi highlighted the importance of AI technology in the Defence Force. He said that unmanned systems will manage the future of defence. In February 2018, the Department of Homeland Security established the Artificial Intelligence Strategy Implementation Working Group. The working group is chaired by V. Kamakoti. Based on the task force's recommendations, NITI (National Institute of Transformation of India) published its National Artificial Intelligence Strategy in 2018.





The Indian government is trying to withdraw traditional equipment with smart robots and machines that possess human like qualities. DRDO has a laboratory specially dedicated to Artificial Intelligence known as the Centre for Artificial Intelligence and Robotics (CAIR). Since robotics is one of the aspects of AI, the CAIR has developed legged robots, wheeled robots, wallclimbing robots, snake robots, Hexa- bots, etc. for surveillance. CAIR has also developed a Project named Multi Agent Robotics Framework (MARF). The MARF will use the Indian Armed forces with a series of robots that would function like soldiers.

DRDO has a laboratory for artificial intelligence called the Centre for Artificial Intelligence and Robotics (CAIR). As it is part of robotic intelligence, CAIR has developed legged robots, rubber robots, wall-climbing robots, snake-like robots, hexagonal robots, etc. for observation and research. has developed. CAIR also developed a project called Multi-Agent Robot Framework (MARF). Al can contribute to the future of the Indian defence industry. AI could add \$957 billion to the current value of the Indian economy by 2035. AI can change the nature of battle. Future wars will be driven more by technology than by the military. Artificial intelligence technology will play an important role in war management. The application of AI in logistics management, training and human resource management will contribute to better military operations. The application of AI in the military will increase efficiency, reduce office work and work faster than humans. The military system equipped with artificial intelligence will succeed in big data, which will provide leaders with a deeper understanding of thestrategy and help countries reduce the risk of war. It will enhance 's decision making ability to help military commanders make better decisions during battle. In addition, the AI will play an important role in tracking, diagnosing, and isolating the wounded on the battlefield. will be efficient and quick in planning medical assistance.

Artificial intelligence is evolving exponentially in this age. It has been a pioneer of change for people. AI does not touch anything. Likewise, he dominated the army. All major forces are working to adopt AI technology in the defence industry. India's efforts in the field of artificial intelligence are still in their infancy. India is working hard to build an AI-based army. India, a late joiner to the artificial intelligence community, needs to create policies to compete with competitors such as America, Russia, develop artificial intelligence software skills, attract investors to invest in artificial intelligence software and hardware development, etc. issues need effort and China.

> ~Vaibhav Yadav TT. AI&ML

Voting System Using Al

A voting website for disabled people would aim to provide a platform that is accessible and user friendly for individuals with disabilities. This website would be equipped with features such as large font options, high contrast displays, screen reader compatibility, and alternative input methods (e.g. keyboard navigation instead of mouse-clicking) to accommodate various disabilities such as visual or mobility impairments. It would also provide information about voting processes and procedures, as well as resources for support and assistance in the voting process. Additionally, the website could offer the option disabled for individuals to request accommodations or assistance with voting, such as curb side voting or accessible voting machines.

As a society, it is crucial that everyone has equal opportunities and access to participate in the democratic process. Voting is a fundamental right and an essential aspect of democracy, and it should be accessible to all citizens, including those with disabilities. That's why it's important to have voting websites for disabled individuals.

Despite the efforts to make voting accessible, many disabled individuals still face physical barriers that prevent them from participating in elections and political processes. By providing a platform for online voting, disabled individuals can cast their votes from the comfort of their own homes or other convenient locations, eliminating the need for them to physically go to polling stations.



These websites are designed to provide an accessible and inclusive platform for citizens with disabilities to exercise their right to vote. They feature options such as alternative text, audio descriptions, and easy-to-use interfaces that accommodate individuals with a wide range of disabilities. In addition, these websites may provide resources and information about accessible voting practices. assistive technology, and accommodations for individuals with disabilities during the voting process.

In this paper, we will delve into the importance of accessible voting for disabled individuals and the various features and resources available on voting websites for disabled individuals.



When developing an online voting platform for disabled individuals, the first step should be to conduct research into the digital literacy levels and assistive technology needs of the target demographic. This will help to determine the specific features that need to be included in the platform to ensure that it is accessible.

Once the features have been identified, the next step should be to develop the platform. This should involve creating an intuitive user interface, incorporating the necessary security measures, and ensuring that the platform is compatible with different assistive technologies. Additionally, measures such as simplified language, clear instructions, and adjustable user interfaces can help to make the platform more accessible.

Once the platform is ready, it should be tested to ensure that it is secure, intuitive, and accessible for disabled users. This can involve user tests, usability testing, accessibility testing, and security testing.

Finally, the platform should be made available to the target demographic, and feedback should be collected to ensure that the platform is meeting its goals.

An online voting platform for disabled individuals can be created by following the following methodology:

Research and understand the needs and requirements of disabled individuals: This involves gathering information about the types of disabilities that individuals may have and how they may impact their ability to use an online voting platform.

Design an accessible interface: The interface should be designed with accessibility in mind, using clear and simple language, high-contrast color schemes, and large font sizes. It should also be usable with assistive technologies such as screen readers. There are several challenges and limitations in the development of an online voting platform for disabled individuals, including:

Technical difficulties: Ensuring the accessibility and compatibility of the platform with various assistive technologies, such as screen readers, magnifiers, and alternative input devices, can be technically challenging.

User experience: Designing an accessible platform that is user-friendly and intuitive for disabled individuals can be difficult, as user preferences and needs may vary widely.

Legal and regulatory issues: Compliance with accessibility regulations and standards, such as the Web Content Accessibility Guidelines (WCAG), can be challenging, particularly in ensuring that the platform is accessible to individuals with a wide range of disabilities.

Cost: Developing and maintaining an accessible online voting platform can be expensive, particularly in terms of the

cost of implementing accessibility features and ensuring ongoing compatibility with assistive technologies.

Awareness and education: Raising awareness of the need for accessible online voting platforms among disabled individuals and policymakers can be a challenge, as well as providing adequate education and support to disabled voters on the use of the platform.

Digital Literacy: People with disabilities may have lower levels of digital literacy and may not be able to navigate the platform easily. This could be addressed by providing clear instructions and simplifying complex tasks.

Assistive Technology: People with disabilities may require the use of assistive technology to access the platform. This could involve providing alternative input devices, providing audio options, or making the user interface customizable.

Security: To ensure that the user's data is kept safe, the system should incorporate measures to protect against potential security threats. This could involve implementing strong authentication methods, encryption, and other security measures.

> ~Ankur Mishra TT. Al&ML

TOOLS NEEDED TO DEVELOP A VOICE ASSISTANT AND HOW YOU CAN CREATE YOUR OWN!

Voice assistants have become ubiquitous in our daily lives. From setting reminders, playing music, to even ordering food, we rely on these virtual assistants to perform various tasks for us. As the use of voice assistants continues to grow, the demand for developing these assistants has increased as well. In this article, we'll discuss the tools you need to develop a voice assistant. Before we dive into the tools needed for developing a voice assistant, let's briefly discuss what a voice assistant is and how it works. A voice assistant is a digital assistant that uses voice recognition, natural language processing (NLP), and artificial intelligence (AI) to interact with users through voice commands. The assistant receives the user's voice command, processes it, and then responds to the user's request. Voice assistants can be used in a variety of devices, including smartphones, smart speakers, and even cars. Developing a voice assistant requires a variety of tools and technologies. Below we've listed the essential tools that are needed for developing a voice assistant.



1. Speech Recognition The first essential tool for developing a voice assistant is speech recognition software. Speech recognition software allows the voice assistant to understand and recognize the user's voice commands. There are several speech recognition software available in the market, including Google Cloud Speech-to-Text, Microsoft Azure Speech to-Text, and Amazon Transcribe. These software can recognize various languages, accents, and dialects.

2. Natural Language Processing The next tool that is needed for developing a voice assistant is natural language processing (NLP). NLP is a subfield of AI that focuses on the interactions between computers and human languages. It allows the voice assistant to understand the meaning behind the user's voice command and respond accordingly. There are several NLP software available in the market, including Google Cloud Natural Language Processing, Microsoft Azure Cognitive Services, and Amazon Comprehend.

3. Text-to-Speech Text-to-speech (TTS) software is also an essential tool for developing a voice assistant. TTS software allows the voice assistant to respond to the user's voice command with a synthesized voice. There are several TTS software available in the market, including Google Cloud Text-to-Speech, Microsoft Azure Speech Services, and Amazon Polly. 4. Dialog Management Dialog management is another important tool for developing a voice assistant. Dialog management software allows the voice assistant to manage the conversation flow and handle interruptions during the conversation. There are several dialog management software available in the market, including Google Dialogflow, Microsoft Bot Framework, and Amazon Lex.



5. Machine Learning Machine learning (ML) is a subfield of AI that focuses on the development of algorithms that can learn from data and make predictions or decisions based on that data. Machine learning is used in voice assistants to improve the accuracy of speech recognition and natural language processing. There are several machine learning software available in the market, including TensorFlow, PyTorch, and Scikit-learn.



6. Cloud Computing Cloud computing is another essential tool for developing a voice assistant. Cloud computing provides the voice assistant with the necessary computing power and storage required to process large amounts of data. There are several cloud computing providers available in the market, including Amazon Web Services, Microsoft Azure, and Google Cloud. 7. APIs APIs (Application Programming Interfaces) are also an essential tool for developing a voice assistant. APIs allow the voice assistant to interact with various external services and applications. There are several APIs available in the market that can be used for developing a voice assistant, including weather APIs, news APIs, and music streaming APIs.



Developing a voice assistant requires a variety of tools and technologies, including speech recognition software, natural language processing, text-to-speech, dialog management, machine learning, cloud computing, programming languages, APIs, development platforms, and testing tools. With these tools, developers can build and deploy voice assistants that are accurate, efficient, and user-friendly. As the demand for voice assistants continues to grow, the development of these tools will continue to evolve, making it easier for developers to innovative create voice assistant applications.

> ~Aman Yevge TT. AI&ML

Swarm Intelligence

The collective behaviour of social animals like ants, bees, and birds serves as the basis for the branch of research known as swarm intelligence. The goal of this area of artificial intelligence is to model and create algorithms that can imitate the behaviour of these species in order to tackle challenging issues. Swarm intelligence's central tenet is the creation of a huge number of simple agents that interact with one another and their surroundings to find the best solutions to a given problem.

Swarm intelligence is predicated on the hypothesis that a collection of uncomplicated agents can work together to accomplish tasks that are beyond the scope of any single agent. This is due to the fact that the agents' aggregate behaviour is governed by straightforward rules that are based on the local knowledge that each agent has access to. These guidelines make the agents very resilient and adaptive by enabling them to cooperate, communicate, and adjust to changes in their surroundings.

The ability of swarm intelligence to resolve challenging issues in a variety of fields, such as decision-making, robotics, and optimization, has made it more and more well-liked in recent years. Route optimiation, resource allocation, and scheduling are just a few examples of the issues it has effectively addressed. Additionally, social networks, financial markets, and biological systems have all been modelled using it.

Swarm intelligence research is not just restricted to the modelling of biological systems. Additionally, researchers have created algorithms that are modelled after the behaviour of various collective systems, including bacterial colonies, immune systems, and even human societies. New algorithms and methods that are very successful at tackling difficult issues have been developed as a result of this.

Overall, Swarm Intelligence is a fascinating field that has the potential to revolutionize many areas of science and technology. It has already led to significant advances in optimization, decision-making, and robotics, and is likely to have an even greater impact in the future.

2.Working:-

Swarm intelligence is a collective behaviour observed in social organisms, such as ants, bees, and termites, in which decentralized, selforganized systems emerge from the interactions between individuals. This approach is being applied to artificial intelligence, where a group of simple agents work together to achieve a common goal. The behaviour of these agents is based on simple rules that define how they interact with each other and with their environment.



capabilities of swarm intelligence

The working of swarm intelligence can be explained through the following steps:

Initialization: The swarm is initialized with a set of agents or particles, each representing a possible solution to the problem at hand.

Evaluation: Each agent is evaluated based on a fitness function that measures its performance. The fitness function is designed to reflect the problem being solved and the goals of the system.

Interaction: The agents interact with each other through a set of rules that define how they communicate, share information, and coordinate their actions. These rules can be based on local information only or can take into account global information.



Update: The agents update their position or behavior based on the information they have gathered from the swarm and their own experience.

Termination: The swarm is terminated when a stopping criterion is met, such as a maximum number of iterations or a satisfactory solution is found.

An example of swarm intelligence in the real world is ant colony optimization (ACO), which is a metaheuristic algorithm that solves combinatorial optimization problems. In ACO, a set of artificial ants' search for a good solution to a problem by laying pheromone trails and following them. The pheromone trails represent a communication channel that enables the ants to share information about the quality of the solutions they have found. The ants use this information to adjust their behaviour and to converge to a good solution. ACO has been successfully applied to various optimization problems, such as the traveling salesman problem, vehicle routing problem, and job shop scheduling problem.

Another example particle is swarm optimization (PSO), which is а metaheuristic algorithm inspired by the movement of bird flocks or fish schools. In PSO, a set of particles move around in a multidimensional search space, looking for the optimal solution to a problem. Each particle's movement is influenced by its own experience and the best solution found by the swarm. The particles update their position and velocity based on these influences, with the aim of converging to the best solution. PSO has been used for various optimization problems, such as feature selection, neural network training, and image segmentation.

In summary, swarm intelligence is a powerful approach that mimics the collective behaviour of social organisms. By working together, a group of simple agents can achieve complex tasks that would be difficult or impossible for an individual agent to accomplish. Swarm intelligence has been successfully applied to various real-world problems, ranging from optimization to pattern recognition and robotics.



1. Advantages and Disadvantages:-

Advantages of Swarm Intelligence:

1] Robustness: The swarm-based systems are highly robust as they can adapt to changes in the environment or system, even if some of the agents fail or are removed.

2] Scalability: Swarm intelligence algorithms can handle large scale problems, as they can be distributed and parallelized, enabling the use of large numbers of agents.

3] Flexibility: Swarm-based systems are highly flexible and can adapt to different applications and problem domains, as they do not require prior knowledge of the problem or a centralized control structure.

4] Self-organization: Swarm intelligence algorithms are able to self-organize, enabling them to operate in a decentralized and distributed manner, without the need for a central controller.

5] Efficiency: Swarm-based systems are often efficient as they can solve problems quickly, thanks to the parallel processing capability of agents.



Disadvantages of Swarm Intelligence:

1] Lack of transparency: Swarm-based systems can be difficult to interpret, as it may not always be clear how the agents have arrived at a particular solution or decision.

2] Parameter tuning: The performance of swarm intelligence algorithms depends on the setting of parameters, which can be challenging and time-consuming.

3] Lack of diversity: Swarm-based systems may converge to suboptimal solutions if the swarm is too homogeneous or lacks diversity.

4] Sensitivity to initial conditions: The behaviour of swarm-based systems can be highly sensitive to initial conditions, which can make them unpredictable in certain situations.

5] Limited applicability: Swarm intelligence algorithms may not be suitable for all problem domains, as they may not always be the most efficient or effective solution.

2. Applications:-

Swarm intelligence has a wide range of applications in various fields. Here are some of the most significant applications of swarm intelligence:

Optimization problems: Swarm intelligence algorithms are widely used for solving optimization problems in various fields, such as logistics, supply chain management, engineering, and finance. These algorithms can efficiently solve complex problems that are difficult to solve using traditional methods.

Robotics: Swarm robotics is an emerging field that uses swarm intelligence algorithms to control groups of robots. Swarm robots can work together to perform complex tasks, such as search and rescue operations, environmental monitoring, and industrial automation.

Image and signal processing: Swarm intelligence algorithms can be used for image and signal processing tasks, such as image segmentation, image classification, and signal filtering. These algorithms can efficiently process large amounts of data and identify patterns in complex datasets.

Finance: Swarm intelligence algorithms can be used for financial forecasting, portfolio optimization, and risk management. These algorithms can help investors make better investment decisions by analysing financial data and identifying market trends.



Agriculture: Swarm intelligence algorithms can be used for precision agriculture, such as optimizing crop yield, reducing pesticide use, and improving soil health. These algorithms can analyse environmental data, such as temperature, humidity, and soil moisture, and provide recommendations to farmers on how to improve crop production.

3. Examples:-

Swarm intelligence has found applications in various fields, from robotics to telecommunications, to transportation and l



Healthcare: Swarm intelligence algorithms can be used for medical diagnosis, drug discovery, and disease modelling. These algorithms can analyse large amounts of medical data and identify patterns that can help doctors diagnose diseases and develop new treatments. ogistics. Here are some examples of how swarm intelligence is being used in the real world:

Ant colony optimization (ACO): ACO is a popular swarm intelligence technique that is based on the behaviour of ant colonies. It is used to solve complex optimization

problems in fields such as transportation, telecommunications, and logistics. For example, ACO has been used to optimize routes for public transportation systems, reducing travel time and fuel consumption.



Particle swarm optimization (PSO): PSO is another popular swarm intelligence technique that is used for optimization problems. PSO is based on the behaviour of a flock of birds or school of fish. It has been used in various applications, such as in engineering design, financial forecasting, and image processing.

Artificial immune systems (AIS): AIS is a type of swarm intelligence that is inspired by the behaviour of the human immune system. AIS has been used in various applications, such as network security and intrusion detection.

From the following Ant colony optimization (ACO) is further explained in detail:-



Ant colony optimization algorithm is inspired by the foraging behaviour of ants. In real-life, ants leave pheromone trails as they move towards a food source. This trail attracts other ants, and over time, the pheromone trail becomes stronger and more ants follow it. This collective behaviour helps the ants to efficiently find food.

In the ACO algorithm, a similar approach is used to solve optimization problems. The algorithm works by simulating the behaviour of a colony of ants searching for the shortest path between a source and a destination.

The ACO algorithm starts by creating a graph, where the nodes represent the cities, and the edges represent the distances between them. The algorithm then creates a number of ant agents, which start moving randomly through the graph. As the ants move, they lay pheromones on the edges they traverse. The amount of pheromone laid on an edge is proportional to the quality of the path.

Over time, the pheromone trail on the shortest path between the source and the destination becomes stronger, as more ants follow it. This results in a positive feedback loop, where the shortest path becomes even more attractive to the ants, and more ants follow it.

At the end of each iteration, the pheromone trail is updated based on the quality of the path taken by each ant. The paths with higher quality are given more pheromone, which makes them more attractive to other ants in the next iteration.

The ACO algorithm has been successfully applied to a variety of optimization problems, such as the travelling salesman problem and the vehicle routing problem. It has been shown to be particularly effective in finding good solutions to complex problems where traditional optimization algorithms fail.

> ~Parth Rahul Mehta TT. Al&ML

HYDROGEN COLLIDER

The hydrogen collider, also known as the proton-proton collider, is a particle accelerator that aims to study the fundamental properties of matter and the universe. It is one of the most powerful machines ever built, and its mission is to push the limits of our knowledge about the universe and its origins.

IThe Large Hadron Collider (LHC) is the world's largest hydrogen collider, located at the European Organization for Nuclear Research (CERN) in Switzerland. It is a circular machine, with a circumference of 27 kilometers, and it uses superconducting magnets to accelerate and collide protons traveling at nearly the speed of light. The collisions of protons at the LHC produce a shower of subatomic particles, which can be detected and analyzed by detectors surrounding the collision point. These collisions can simulate the conditions that existed in the early universe, a fraction of a second after the Big Bang, and help scientists understand how the universe evolved over time.

One of the most famous discoveries made by the LHC was the Higgs boson particle, which was predicted by the Standard Model of particle physics but had never been observed before. The discovery of the Higgs boson was a major breakthrough in particle physics and helped confirm our understanding of how particles acquire mass.

The LHC is also used to search for dark matter, which is believed to make up a significant portion of the universe but has not been directly observed yet. Scientists hope that by studying the collisions at the LHC, they can find evidence of new particles and interactions that could explain the nature of dark matter. Despite the tremendous potential of the LHC, it is not without controversy. Some critics argue that the massive energy required to operate the collider could pose a threat to the environment and human health. However, scientists at CERN have conducted extensive safety studies and have concluded that the collider poses no significant risk to public health or the environment



In conclusion, the hydrogen collider is a remarkable scientific instrument that has enabled scientists to make groundbreaking discoveries about the universe and its origins. With ongoing research and development, the LHC and other particle accelerators will continue to push the boundaries of our knowledge and help us better understand the mysteries of the universe.



The Event Horizon Telescope (EHT) is an international collaboration of radio telescopes that has captured the first-ever image of a black hole. Black holes are regions of space where gravity is so strong that nothing, not even light, can escape. This makes it incredibly difficult to capture an image of them, but the EHT has managed to do just that. The EHT links together radio telescopes from around the world, creating a virtual telescope that is the size of the Earth. By combining the data collected by each telescope, the EHT is able to create an image with a resolution that is 1,000 times better than the Hubble Space Telescope. In April 2019, the EHT captured an image of the black hole at the center of the M87 galaxy, revealing the ring of light emitted by the superheated gas that surrounds it.

This remarkable achievement has not only given us a glimpse into the mysterious world of black holes, but it has also opened up new avenues for scientific research. By studying the behavior of black holes, scientists hope to gain a better understanding of the fundamental laws that govern the universe. The EHT has already led to groundbreaking discoveries, such as the confirmation of Einstein's theory of general relativity. The EHT has also provided us with a new tool for studying the universe. By observing black holes, we can learn about the physics of gravity and the behavior of matter under extreme conditions. The EHT has the potential to reveal new information about the origins of the universe and the evolution of galaxies.



In conclusion, the Event Horizon Telescope is a remarkable achievement that has allowed us to see the unseeable. It has opened up a new era of scientific discovery and has given us a glimpse into the workings of the universe.

The EHT is a testament to what we can achieve when we come together and push the boundaries of what is possible. With ongoing research and development, the EHT and other technological advancements will continue to reveal new insights into the mysteries of the universe. The EHT has also shed light on the dynamics of black holes and their role in shaping galaxies. The imaging of the M87 black hole revealed a jet of high-energy particles that extends for thousands of light-years from the black hole. This jet is thought to play a crucial role in regulating the growth of the galaxy by heating and ionizing the gas in its surroundings.

The EHT's success has also inspired the development of new technologies and techniques for observing the universe. For example, researchers are exploring the use of machine learning algorithms to improve the image quality and increase the speed of data processing for the EHT. The EHT project has also paved the way for future astronomical collaborations, such as the Square Kilometer Array (SKA), which will be the largest radio telescope ever built. The SKA will be capable of observing black holes and other astronomical objects in even greater detail than the EHT. Furthermore, the EHT project has inspired a new generation of scientists and engineers to pursue careers in astronomy and space science. The collaboration has also emphasized the importance of international cooperation in advancing scientific knowledge and understanding.



In conclusion, the Event Horizon Telescope is a remarkable achievement that has given us a new perspective on the universe. Its groundbreaking imaging of a black hole has opened up new avenues for scientific research and technological innovation. The EHT project has demonstrated the power of collaboration and international cooperation in advancing our understanding of the universe. We can only imagine the discoveries and advancements that will come from continued efforts in this field

The Power of Seeing: An Introduction to Computer Vision

Computer vision is an exciting field of artificial intelligence that enables machines to interpret and understand visual information from the world around them. From self-driving cars to facial recognition software, computer vision is revolutionizing the way we interact with technology. In this article, we will explore the basics of computer vision, how it works, and some of its applications.



Computer vision is the process by which machines are given the ability to understand visual data. Unlike human vision, which is natural and effortless, computer vision requires sophisticated algorithms to interpret and understand what is being seen. The goal of computer vision is to allow machines to interpret and understand visual information in much the same way that humans do.

Computer vision relies on a variety of techniques, including image processing, machine learning, and deep learning. The algorithms used in computer vision are designed to recognize patterns and objects within visual data, and to categorize them into different classes. Deep learning, in particular, has proven to be very effective in computer vision, as it allows models to learn and recognize patterns in visual data with high accuracy.



1. 3D Computer Vision: 3D computer vision is an emerging field that focuses on reconstructing 3D objects and environments from 2D images or video data. This technology has numerous applications, including augmented and virtual reality, robotics, and autonomous vehicles.

2. Simultaneous Localization and Mapping (SLAM): SLAM is a technique that enables a robot or a device to map an unknown environment while simultaneously localizing itself within that environment. SLAM has numerous applications, including autonomous navigation, virtual reality, and robotics. Recent advancements in SLAM have made it possible to build accurate and detailed maps of indoor and outdoor environments using only a camera or a sensor.

3. Attention Mechanisms: Attention mechanisms are used in deep learning models to focus on important regions of an image, which can improve accuracy and efficiency in tasks like object detection and segmentation. Attention mechanisms have been used in recent state-of-the-art models like BERT and GPT-3.

1. Autonomous Vehicles: Computer vision plays a crucial role in the development of autonomous vehicles by enabling them to interpret and understand their surroundings. This allows them to make decisions about navigation, object detection, and obstacle avoidance, ultimately making the roads safer for everyone.

2. Healthcare: Computer vision is being used in healthcare to aid in the diagnosis of diseases and to monitor patient health. For example, it can be used to detect skin cancer, analyze medical images, and track patient movements to improve rehabilitation outcomes.

3. Security and Surveillance: Computer vision is used for security and surveillance purposes to detect and track objects, recognize faces, and identify anomalies in video data. This technology is used in a wide range of settings, from airports and banks to public spaces and private residences



Computer vision is a rapidly evolving field with the potential to revolutionize the way we interact with technology. From enhancing our entertainment experiences to making our daily lives more efficient and safe, computer vision has the power to transform industries and change lives. As the field continues to evolve, it will be exciting to see the new and innovative applications that emerge

> ~letisha Rathod ST. Al&ML

Reinforcement Learning

Reinforcement learning (RL) is a branch of artificial intelligence (AI) that enables machines to learn from experience and make decisions based on that experience. It is a type of machine learning where an agent learns to interact with an environment to achieve a goal through trial and error. RL has been used in various domains such as robotics, gaming, finance, and healthcare.In article, will explore this we what reinforcement learning is, how it works, and its real-world applications. Reinforcement learning is a subset of machine learning that enables an AI system to make decisions based on feedback from its environment.

This feedback comes in the form of rewards or penalties, which the AI system uses to adjust its behavior over time. Reinforcement learning has been used to train AI systems to play games, control robots, and even make financial trades.

Reinforcement learning is a type of machine learning that allows an agent to learn from the environment by performing actions and observing the consequences. The agent interacts with the environment through trial and error, where it receives feedback in the form of rewards or penalties for its actions. The goal of the agent is to learn the optimal policy that maximizes the cumulative reward over time. Reinforcement learning works by using a feedback loop where the agent takes an action in the environment, receives a reward or penalty, and then updates its policy accordingly. The agent's policy is a mapping from states to actions that tells the agent what action to take in a particular state. The RL algorithm consists of three main components: the agent, the environment, and the reward signal.

The agent takes an action in the environment, which results in a new state and a reward signal. The agent then uses this information to update its policy, and the process repeats until the agent has learned the optimal policy.



Reinforcement learning has been applied in various domains such as robotics, gaming, finance, and healthcare. In robotics, RL has been used to teach robots to perform complex tasks such as grasping objects, navigating through environments, and manipulating objects. In gaming, RL has been used to develop intelligent game-playing agents that can learn to play games such as chess, Go, and poker. In finance, RL has been used to develop trading strategies that can learn from historical data and make predictions about future market trends. In healthcare, RL has been used to develop personalized treatment plans for patients with chronic diseases such as diabetes and cancer

In conclusion, reinforcement learning is a powerful tool that enables AI systems to learn from experience and make decisions based on feedback from their environment. While it is not without its challenges, the potential benefits of reinforcement learning are significant and are likely to drive continued research in this field. As AI systems become more advanced, it is likely that reinforcement learning will play an increasingly important role in shaping the future of AI.



The Hidden Consequences of AI Training: The Water Footprint of Large Language Models

As Artificial intelligence and machine learning continue to change the way we interact with technology, the power of AI education is growing. While the environmental impact of data on energy use and carbon emissions is often discussed, the use of large amounts of water is associated and often overlooked by training large language models such as OpenAI's ChatGPT and Google's Bard. In fact, recent research by the University of Colorado at Riverside and the University of Texas at Arlington has shown that the water footprint of AI Training is a significant and growing issue. In this article, we explore the hidden impact of AI training on water use and the environment, and the need to raise awareness and take action to address these issues.

Training large language models like Open Ai's ChatGPT and Google's Bard requires a lot of power and data. Recent research has shown that training a model like the GPT-3 uses 700,000 liters of water, equivalent to cooling the towers of a nuclear power plant. Some points to consider:

- According to a recent study by the University of Colorado Riverside, training a large language model like the GPT-3 requires about 1,000 times more water than training a deep learning model.
- A Stanford AI released a report last week looking at differences in energy consumption among four prominent AI models, estimating OpenAI's GPT-3·released 502 metric tons of carbon during its training.
- GPT-3, would need to "drink" a 500-milliliter water bottle in order to complete a basic exchange with a user consisting of roughly 25-50 questions.
- As the AI models are constantly developing and evolving there need of water is also growing to train them. It is necessary to find some solution to this crisis





When considering the water footprint of AI, researchers differentiate between water withdrawal and consumption. Water withdrawal refers to physically removing water from a source like a river or lake, while consumption specifically refers to the loss of water through evaporation when it's used in data centers. The focus of research on AI's water usage is mainly on the consumption side of the equation, where the water cannot be recycled.

To keep server rooms cool, the temperature is usually kept between 50 and 80 degrees Fahrenheit to prevent equipment from overheating. Maintaining this ideal temperature is a constant challenge because servers convert electrical energy into heat. Cooling towers, such as the ones pictured below, are commonly used to counteract this heat and maintain the server room's temperature through evaporation of cold water.

While cooling towers do the job, they require vast amounts of water to do so. The researchers estimate that an average data center consumes around a gallon of water for every kilowatt-hour expended. However, not just any water can be used. Data centers draw from freshwater sources to avoid the corrosion or bacteria growth that can occur with seawater.

Freshwater is also necessary for humidity control in the rooms. The researchers also highlight that data centers should be held accountable for the water needed to generate the high amounts of electricity they consume, which they call "off-site indirect water consumption." As artificial intelligence (AI) becomes more pervasive, concerns about its impact on the environment are growing. While artificial intelligence is often thought as a solution to many of the world's problems, it can also impact the environment. Some of the key affecting factors are:

• <u>Water consumption:</u>

AI training requires a lot of computing powers, and data centers that support this computing powers need a lot of water to cool. New research suggests training for GPT-3 alone consumed 185,000 gallons (700,000 liters) of water. An average user's conversational exchange with ChatGPT basically amounts to dumping a large bottle of fresh water out on the ground, according to the new study. Given the chatbot's unprecedented popularity, researchers fear all those spilled bottles could take a troubling toll on water supplies, especially amid historic droughts and looming environmental uncertainty in the US.

The demand for artificial intelligence and other information technologies has led to a "competition" of data centers to meet the need. This has led to the establishment of data centers in areas where energy is cheap and abundant, often non-renewable, and has a significant impact on the environment

• Energy consumption and carbon emissions:

The energy consumption of AI training requires a lot of electricity, which has an impact on carbon emissions. The data centers supporting AI education are among the largest energy users in the world, and some estimates suggest that the carbon footprint of the AI education show alone could be as large as the entire aviation industry. These centers often rely on non-renewable energy sources such as coal. It is important to invest in renewable energy and increase the power of data centers to reduce the carbon footprint of AI education.

In conclusion, the impact of AI training on water use and the environment is significant and cannot be ignored. The process of training large language models like OpenAI's ChatGPT and Google's Bard requires a lot of water, leads to depletion of fresh water and impacts the environment. High energy consumption in the data center's also causes carbon emissions and other environmental concerns. Taking action to raise awareness of this issue and reduce the environmental impact of AI training is crucial. This includes investing in renewable energy, improving the efficiency of data centers, and finding ways to reduce the amount of water needed to train AI models.



~Prabhat Maurya FT. Al&ML

Transparency is Key: The Importance of Explainable AI in Today'<mark>s World</mark>



Artificial intelligence (AI) is revolutionizing many aspects of modern life, from healthcare to finance to transportation. AI algorithms can be used to make predictions, classify data, and even control autonomous systems. However, these systems can sometimes make decisions that are difficult to understand or explain, leading to concerns about their fairness, transparency, and accountability. This is where Explainable AI (XAI) comes in.

XAI refers to methods and techniques that enable humans to understand and interpret the decisions made by AI systems. By providing explanations of how the system arrived at a particular decision, XAI can help to build trust in AI systems and ensure their responsible use.

The importance of explainable AI cannot be overstated, as it is essential for ensuring that AI systems are trustworthy, safe, and fair.

One of the most significant benefits of explainable AI is that it allows humans to understand how an AI system is making decisions. This is crucial for a variety of reasons, including accountability, transparency, and user acceptance. When people can understand how an AI system works, they can trust it more and feel more comfortable using it. In contrast, opaque AI systems can cause suspicion, confusion, and even fear among users.

Explainable AI also promotes fairness and reduces bias in AI systems. With transparent algorithms, it is easier to identify and correct issues of bias that may be embedded in the data or the AI model itself. This is especially important in applications such as hiring, lending, and criminal justice, where decisions based on AI can have significant impacts on people's lives. The working of explainable AI involves several steps that are designed to make the AI system more transparent and explainable to the users. The following are the key components of the working of explainable AI:

- <u>Data Collection</u>: The first step in developing an explainable AI system is collecting relevant data from various sources. This data will be used to train the AI model to make predictions or decisions.
- <u>Data Preprocessing</u>: Once the data is collected, it needs to be preprocessed to remove any irrelevant or erroneous information. Data preprocessing also involves identifying any biases in the data and correcting them to ensure that the AI model is fair and unbiased.
- <u>Algorithm Selection:</u> The next step is to select the appropriate algorithm for the AI model. The selection of the algorithm will depend on the type of problem being solved, the size of the data, and the performance requirements.
- <u>Model Training:</u> After selecting the algorithm, the AI model is trained on the preprocessed data. During the training process, the AI model learns from the data to make predictions or decisions.
- <u>Model Evaluation</u>: Once the model is trained, it is evaluated to determine its accuracy and performance. The evaluation is done using a separate set of data that was not used in the training process.
- <u>Explainability Techniques</u>: The final step in developing an explainable AI system is to incorporate techniques that make the AI system transparent and explainable. There are various explainability techniques available, such as decision trees, rule-based systems, and model visualization tools, that help users understand how the AI system arrived at its decisions or predictions.



The application of XAI is becoming increasingly important, as AI is being used in various industries and applications, such as healthcare, finance, autonomous vehicles, customer service, and legal systems. XAI can provide transparency, accountability, and fairness to AI-based systems, which is essential for their adoption and success. Furthermore, XAI can help in detecting and mitigating biases in AI systems, which can result in inaccurate or unfair decisions or recommendations.

- Healthcare: Explainable AI can help doctors and healthcare providers to understand how AI models arrive at their diagnoses or treatment recommendations. For example, an XAI model can explain the factors that led to a specific diagnosis or the reasons behind a specific treatment recommendation. This can increase the transparency and trust in AI-based healthcare systems, which is essential for their adoption and success. Furthermore, XAI can help in detecting and mitigating biases in healthcare data, such as gender or racial biases, which can result in unfair diagnoses inaccurate or and treatments.
- Finance: XAI can help in explaining the decision-making process behind financial models, such as credit scoring or investment recommendations. For example, an XAI model can explain why a particular customer received a specific credit score or recommendation, investment providing transparency and accountability to customers and regulators. This can also help in detecting and mitigating biases in financial data, which can result in inaccurate or unfair financial decisions.
- · Autonomous Vehicles: XAI can be used to explain the decision-making process of autonomous vehicles, such as why a particular maneuver was executed or why a specific route was chosen. This can increase the safety and trust in autonomous vehicles, which is essential for their widespread adoption. Furthermore, XAI can help in detecting and mitigating biases in the data used to train these systems, such as bias towards certain types of roads or environments.



- <u>Customer Service:</u> XAI can be used to develop chatbots or virtual assistants that can explain the reasoning behind their responses to customer queries. For example, an XAI chatbot can explain why a particular product or service was recommended to a customer, based on their past behavior or preferences. This can improve the overall customer experience and increase the trust in AI-based customer service systems.
- <u>Legal:</u> AI can be used to explain the reasoning behind legal decisions, such as why a particular verdict was reached or why a specific sentence was given. This can increase the transparency and accountability of the justice system, which is essential for ensuring fairness and justice for all. Furthermore, XAI can help in detecting and mitigating biases in legal data, such as bias towards certain types of cases or defendants.

Explainable AI (XAI) is a rapidly evolving subfield of artificial intelligence (AI) that aims to make AI more transparent, interpretable, and trustworthy. The development of XAI is critical for ensuring that AI is used ethically and responsibly, and for enabling humans to better collaborate with AI systems for improved decision-making and outcomes.

As AI continues to advance and become more ubiquitous, the development of XAI will become increasingly important. The challenges of XAI are significant, as making AI more explainable and interpretable is a complex task that requires a multidisciplinary approach. However, the potential benefits of XAI are enormous, and XAI is likely to be a key factor in the responsible and ethical development of AI in the future.





ACM SIGAI-TCET

Tentative Plan for activities in EVEN Sem 2022-23

Sr. No.	Week No	Date	Day	Key Activity	Faculty Incharge
1	1st Week	21-Jan-23	Saturday	Core Committee Formation	
2	2 nd Week	28-Jan-23	Saturday	Membership drive	
3	4 th Week	10-Feb-23	Friday	National Level Expert Talk	
4	6 th Week	20-Feb-23 to 25-Feb-23	Monday - Saturday	Multicon-W 2023 Events Qualification Pack Workshop Annual Conference Multicon-W Organization	Mrs. Rupinder Kaur
5	8th Week	10-Mar-23	Friday	National Level Technical Debate	
6	10 th Week	24-Mar-23	Friday	National Level Kaggle Competition	
7	12 th Week	08-Apr-23	Monday	National Level webinar on "Dive into AI&ML Universe"	







-Rajesh Verma Technical Manager Freelancer

Q1

What inspired you to pursue a career in AI engineering, and what experience do you have with AI technologies and programming languages?

I have always been interested in solving complex problems using technology, and the potential of AI to transform industries and improve people's lives is what drew me to this field. I have experience working with various AI technologies, such as machine learning, deep learning, computer vision, and natural language processing, and I am proficient in programming languages such as Python, Java, and C++.



How do you approach a new AI project, and what steps do you take to ensure that it meets the desired outcome?



Q3

Before starting a new AI project, I first try to gain a deep understanding of the problem we are trying to solve and the business requirements. Then, I work with the team to define the project's scope and goals and identify the data sources and algorithms we will use. Once we have a plan in place, I create a roadmap that outlines the milestones, timelines, and deliverables, and I communicate this plan with the stakeholders to ensure that we are aligned and have buy-in. Throughout the project, I track progress, adjust the plan as needed, and ensure that we are meeting the desired outcome.

Can you discuss a project you have worked on in the past and describe your role, the technologies used, and the outcome?

One project I worked on involved developing an AI-powered chatbot for a customer service team. My role was to lead the development of the natural language processing (NLP) component of the chatbot, which involved training a machine learning model to understand and respond to customer queries. We used Python and the TensorFlow library for the model training, and we integrated the chatbot with the team's existing customer service software. The outcome was a successful deployment of the chatbot, which improved the team's response time and efficiency and resulted in higher customer satisfaction ratings.

How do you ensure that the AI models you develop are ethical and unbiased, and what steps do you take to mitigate any potential risks or negative consequences?

Q4

Q6

ANS

First, we carefully select the data sources we use to train the models and ensure that they are representative and diverse. We also regularly monitor the models' performance and accuracy to identify and address any biases. Additionally, we involve diverse teams and stakeholders in the development process to ensure that the models are inclusive and consider multiple perspectives. We also conduct thorough testing and validation before deploying the models to mitigate any potential risks or negative consequences.

What are some common challenges you have faced when working on AI projects, and how have you overcome them?

One common challenge is data quality and availability, which can affect the accuracy and performance of the AI models. To overcome this, we work closely with the data team to ensure that the data is cleaned, labeled, and properly formatted. Another challenge is selecting the right algorithm and parameters for the model, which can impact its performance and accuracy. To address this, we conduct extensive testing and experimentation and compare the results to determine the optimal approach. Finally, we also face challenges related to model interpretability and explainability, which are critical for gaining stakeholder trust and ensuring ethical use of the technology. To address this, we use techniques such as feature importance analysis and model visualization to make the models more transparent and understandable.

How do you stay up-to-date with the latest AI research and advancements, and what resources do you rely on?

I stay up-to-date with the latest AI research and advancements by attending conferences, reading research papers and articles, and participating in online forums and communities. I also follow thought leaders in the field on social media and subscribe to newsletters and podcasts.

-Vishal Dubey Tandem Crystal pvt Ltd Senior Python developer

Q1 Can you tell us about your experience with deep learning?

- Sure, I have been working in the field of deep learning for the past 5 years. During this time, I have worked on various projects ranging from computer vision to natural language processing. I have experience working with various deep learning frameworks such as TensorFlow, PyTorch, and Keras.
 - How do you stay up to date with the latest developments in the field of deep learning?
- I stay up to date by regularly reading research papers, attending conferences and workshops, and participating in online forums and discussions. I also have a network of colleagues and industry experts that I collaborate with to share knowledge and insights.
 - Can you walk us through your approach to developing a deep learning model?
- Sure, my approach typically involves the following steps: Defining the problem and setting clear goals Gathering and preprocessing data Exploring and visualizing the data Selecting an appropriate deep learning architecture Training and optimizing the model Evaluating and testing the model Deploying and monitoring the model in production
 - How do you handle overfitting in deep learning models?

ANS

To handle overfitting, I use techniques such as regularization, dropout, and early stopping during model training. I also use techniques such as cross-validation and data augmentation to ensure that the model is not overfitting to the training data.

Q5

Have you worked with any specific deep learning architectures? Can you discuss your experience with them?

ANS

Q6

Yes, I have worked with various deep learning architectures such as Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), and Transformer models. I have experience using CNNs for image classification and object detection tasks, RNNs for natural language processing tasks such as language modeling and text classification, and Transformers for language tasks such as machine translation and text generation.

How do you handle data preprocessing for deep learning models?

Data preprocessing is a critical step in developing a deep learning model. I typically handle data preprocessing by first cleaning and normalizing the data. I then use techniques such as one-hot encoding, tokenization, and feature scaling to prepare the data for the model. I also use techniques such as stratified sampling and cross-validation to ensure that the data is representative of the population and to avoid overfitting.



Can you discuss a project you worked on where deep learning played a crucial role?

Data preprocessing is a critical step in developing a deep learning model. I typically handle data preprocessing by first cleaning and normalizing the data. I then use techniques such as one-hot encoding, tokenization, and feature scaling to prepare the data for the model. I also use techniques such as stratified sampling and cross-validation to ensure that the data is representative of the population and to avoid overfitting.









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Received award for best paper presented in Department of AI&ML in Multicon-W 2023 TT AI&ML



Rohit Gupta Google kickstart 1701 rank



ACKNOWLEDGEMENT



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"The strength of the team is each individual member. The strength of each member is the team." - Phil Jackson

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-The Editorial Team TEJAS