New Technologies

Nethru Randev Wickramasekara
Diploma in Software Engineering
23.1 DSE - NIBM

ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) is a set of technologies that enable computers to perform a variety of advanced functions, including the ability to see, understand and translate spoken and written language, analyze data, make recommendations, and more.

Benefits of AI

1) Automation - AI can automate workflows and processes or work independently and autonomously from a human team.
2) Reduce human error - AI can eliminate manual errors in data processing, analytics, assembly in manufacturing, and other tasks.
3) Eliminate repetitive tasks - AI can be used to perform repetitive tasks, freeing human capital to work on higher impact problems.
4) Fast and accurate - AI can process more information more quickly than a human, finding patterns and discovering relationships in data that a human may miss.
5) Infinite availability - AI is not limited by time of day, the need for breaks, or other human encumbrances.
6) Accelerated research and development - The ability to analyze vast amounts of data quickly can lead to accelerated breakthroughs in research and development.

Applications And Use Cases for Artificial Intelligence

1) Speech recognition - Automatically convert spoken speech into written text.
2) Image recognition - Identify and categorize various aspects of an image.
3) Translation - Translate written or spoken words from one language into another.
4) Predictive modeling - Mine data to forecast specific outcomes with high degrees of granularity.
5) Data analytics - Find patterns and relationships in data for business intelligence.
6) Cybersecurity - Autonomously scan networks for cyberattacks and threats.

VIRTUAL REALITY

Virtual reality is a simulated 3D environment that enables users to explore and interact with a virtual surrounding in a way that approximates reality. There has been a growing interest in the potential of VR across a number of other areas.

1) Education - VR offers educational institutions new methods for teaching and learning.
2) Healthcare - VR has the potential to benefit individuals across the healthcare industry, including patients, practitioners and researchers.
3) Training - VR makes it possible to train personnel safely, efficiently and cost effectively.
4) Retail - VR has already made some inroads into retail, but the industry has only scratched the surface.
5) Real estate - VR can benefit real estate in a number of ways.

6) Entertainment - VR has already had an impact on gaming, but it also promises to transform the film and television industries, providing viewers with an immersive experience that puts them right into the scene.

NANOTECHNOLOGY

Nanotechnology is a field of science and engineering that focuses on the design and manufacture of extremely small devices and structures.

Uses of Nanotechnology

1) Electronics
2) Cosmetics and sunscreen
3) Sporting goods
4) Clothing
5) Building and construction materials
6) Biomedicine
7) Healthcare technology
8) Food
9) Renewable energy

Benefits of Nanotechnology

1) Improved materials - Nanomaterials can be stronger, lighter and more durable than traditional materials.
2) Increased energy efficiency - We can use nanomaterials to create more efficient batteries, solar cells and fuel cells.
3) Enhanced medical treatments - We can use nanotechnology to create more targeted and effective drugs, as well as diagnostic tools and medical devices.
4) Improved water filtration and purification – We can use nanomaterials to create more effective filters for removing contaminants from water
5) Improved food safety and agriculture - With the help of nanotechnology, we can create sensors for detecting food contaminants, as well as fertilizers and pesticides that are more targeted and less harmful to the environment.

Risks of Nanotechnology

1) Health and environmental risks - There are concerns that nanotechnology in food, for instance, could be harmful to humans and the environment.
2) Economic risks - There is potential for nanotechnology to disrupt traditional industries and create economic inequality.
3) Ethical risks - There are also ethical concerns surrounding the use of nanotechnology, such as the potential for it to be used for military or surveillance purposes.

QUANTUM COMPUTING

Quantum computing is a new approach to calculation that uses principles of fundamental physics to solve extremely complex problems very quickly. Quantum computing is a rapidly emerging technology that harnesses the laws of quantum mechanics to solve problems too complex for classical computers.

Industries stand to benefit the most from quantum computing

1) Pharmaceuticals - Quantum computing has the potential to revolutionize the research and development of molecular structures in the biopharmaceuticals industry.
2) Chemicals - Quantum computing could be used to improve catalyst design, which could enable savings on existing production processes.
3) Automotive - The automotive industry could benefit from quantum computing in its R&D, product design, supply chain management, production, and mobility and traffic management.
4) Finance – Quantum computing use cases in finance are slightly further in the future.

CRYPTOGRAPHY

Cryptography is technique of securing information and communications through use of codes so that only those person for whom the information is intended can understand it and process it.

Features of Cryptography

1) Confidentiality - Information can only be accessed by the person for whom it is intended and no other person except him can access it.
2) Integrity - Information cannot be modified in storage or transition between sender and intended receiver without any addition to information being detected.
3) Non repudiation - The creator, sender of information cannot deny his intention to send information at later stage.
4) Authentication - The identities of sender and receiver are confirmed. As well as destination/origin of information is confirmed.

Applications of Cryptography

1) Computer passwords - Cryptography is widely utilized in computer security, particularly when creating and maintaining passwords.
2) Digital Currencies - To safeguard transactions and prevent fraud, digital currencies like Bitcoin also use cryptography.
3) Secure web browsing - Online browsing security is provided by the use of cryptography, which shields users from eavesdropping and man-in-the-middle assaults.
4) Electronic signatures - Electronic signatures serve as the digital equivalent of a handwritten signature and are used to sign documents.
5) Authentication - Cryptography is used for authentication in many different situations, such as when accessing a bank account, logging into a computer, or using a secure network.

6) Cryptocurrencies - Cryptography is heavily used by cryptocurrencies like Bitcoin and Ethereum to safeguard transactions.
7) End to end encryption - End to End Encryption is used to protect two-way communications like video conversations, instant messages, and email.

Advantages of Cryptography

1) Access Control - Cryptography can be used for access control to ensure that only parties with the proper permissions have access to a resource.
2) Secure Communication - It offers secure mechanisms for transmitting private information like passwords, bank account numbers, and other sensitive data over the internet.
3) Protection against attacks - Cryptography aids in the defence against various types of assaults, including replay and man-in-the-middle attacks.
4) Compliance with legal requirements - Cryptography can assist firms in meeting a variety of legal requirements, including data protection and privacy legislation.

References - *https://www.ibm.com/topics/artificial-intelligence#:~:text=At%20its%20simplest%20form%2C%20artificial,in%20conjunction%20with%20artificial%20intelligence* / *https://ec.europa.eu/health/scientific_committees/opinions_layman/en/nanotechnologies/l-2/1-introduction.htm#:~:text=Nanotechnology%20refers%20to%20the%20branch,of%20a%20millimetre)%20or%20less* / *https://www.techtarget.com/searchsecurity/definition/cryptography* / *https://www.ibm.com/topics/quantum-computing*