Part 1:

1. **Describing the fundamental aspects of AI:**

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| **AI** | **Machine Learning(ML)** | **Deep Learning(DL)** |
| Focuses on creating intelligent machines. And to enable them to mimic the human brain. | Subset of AI and its scope is mainly algorithms. It uses certain methods to improve over time and experience. | DL is a Subset of ML which mainly uses neural networks which is close to the neurons present in human. In order to imitate the human brain. |
| AI is able to use multiple techniques such as machine learning, genetic algorithms, and other methods. | Machine learning trains certain models on a certain data in order to make decisions or even predictions. | Deep learning focuses on neural networks. |
| AI might be considered as a computer algorithm which shows intelligence by making decisions on its own. | ML is one of the AI techniques which helps the systems to build themselves through learning from a given data. | DL is considered as a ML algorithm which uses multiple layers (deep) neural network. It analysis that data and give outputs. |
| AI’s efficiency depends on the efficiency provided by two factors:  The Machine learning and deep learning in that order. | The Machine learning is not as efficient as deep learning as it is not able to handle huge amount of data. | Deep Learning is much more powerful than Machine learning as it can work with huge number of datasets easily. |
| Examples of the artificial intelligence: robotics and healthcare. | Examples of the Machine learning applications: fraud detection, predictive analytics. | Examples of the Deep Learning applications: image and speech recognition, self-driving cars. |

Artificial intelligence:

Artificial intelligence is considered as a computer science field. The main focus of artificial intelligence is to create machines that are very intelligent that are able to accomplish certain tasks and activities that normally requires the human intelligence to achieve. So basically, the main goal of AI is to create machines that are able to feel, think, behave, interact, and achieve goals exactly the same as any human being would.

The study of AI began in the mid-20th century, after the advancements of computers and progress in the computer science field. The term Artificial intelligence came up in the Dartmouth conference in 1956. In that conference, four people found this term while they were discussing the chance of developing a technology that could be able to have the intelligence of people. Machine learning and neural networks came up between 1980-1990s. At that time, there were advancements in techniques of machine learning, and certain algorithms were developed such as decision trees, and neural networks.

Artificial intelligence is evolving rapidly lately due to multiple reasons:

1. The huge increase in computing power: the huge growth of computing power is enabling us to train and develop complex AI models.
2. Big Data: the growth of digital data and the advancement in the storages for these data, as well as the great processing technologies has enabled the AI systems to gain access to massive amounts of data for decision-making and training.
3. Development of machine learning techniques: the development of deep learning and other complex and advanced machine learning methods has strongly enhanced the ability of AI systems. These methods are excellent in learning patterns and obtaining useful insights from large amounts of data.

Big Data:

Big data is term to describe a huge amount of data that is generated from multiple sources around the world. These data are very huge that they can’t be managed or understood without using special tools. Big data contains several kinds of data such as numbers, litters, pictures, words, videos, and more. Its data can be categorized into different types, some of them are organized, structures, or labeled. And some are partially structured, and others are messy. These data could be used to gain useful information’s from it, which could help us in different fields in life. For example:

1. Social media (Facebook, Instagram, Twitter) which generates huge amounts of texts, pictures, videos.
2. Online platforms (amazon, eBay, Alibaba) generate huge amounts of data from users’ interaction, such as their purchases, and browsing behaviors.
3. Video streaming platforms such as YouTube, Netflix, and others generate massive amounts of data through videos, users’ interaction, and views history.

Features of big data:

1. Volume: the term big data focuses mainly on the huge amount of data that can’t be stored in traditional systems. The data that are generated could range from terabytes to petabytes if not even more.
2. Velocity: it means that big data is being generated rapidly every moment from enormous sources. This data needs efficient processing to be able to keep up with this speed of data generating.
3. Variety: big data includes a wide range of different formats and types of data. for example, there are structured data which are labeled and well organized in a structured format such as tables. Also, there is unstructured data which is unorganized.

New types of data such as photos, videos, and voice data, is different from traditional data types is multiple ways:

1. The complexity and size of data: the new types of data especially images and videos, are a lot larger in size that the traditional data such as texts and numbers. The difference is that new data types need more storage and processing.
2. Data structure: the new types of data such as videos and images are unstructured compared to traditional data that are often structured. To analyze the unstructured data, some advanced techniques are needed.
3. The amount of information: images and videos provide visual data that could be used in various fields, compared to traditional data which are not able to provide visual data.
4. **Difference between Strong AI and Week AI:**
5. Week AI

* Definition:

Week AI is also known as the narrow AI. Week AI is designed to perform specific tasks with limited information and functions. These AI are made to achieve certain goals such as highlighting a specific problem and they lack the ability to think, feel, update, or even have the intelligence of human. Therefore, they are designed to perform perfectly in certain aspects, but cannot perform in any other field.

* Example of Week AI:

1. Virtual assistance for people: virtual assistance such as google assistance, Amazons Alexa, and apple Siri are designed in order to obey and perform certain (limited) voice commands.
2. Recommendations systems: these systems are used in certain platform to provide personalized recommendations depending on what people like most to perform in these platforms. Recommendation systems are used in Netflix, YouTube, and amazon.
3. Image recognition systems: these systems are used to identify objects within images and tag them and relate them to other objects.
4. Strong AI

* Definition: Strong AI are a lot more sophisticated that Week AI. This type of AI has a high level of intelligence very close or equal to the intelligence of humans. Also, they are able to perform complex tasks that normally require humans to achieve. Moreover, this type of AI is able to understand, learn from experience, apply its knowledge, and adapt with changes.
* Example of Strong AI: there are no specific examples of Strong AI but a future example, or what people are trying to achieve are robots that are able to behave, think, act, learn, teach, and feel exactly like humans. But it hasn’t been achieved yet.

Summary: Week AI focuses on certain tasks, but Strong AI aims to reach human intelligence.

1. **Applications of AI systems:**

Artificial intelligence is being used nowadays in a lot of fields to solve different problems.

* Examples of fields that are using AI in their systems:

1. Healthcare: AI has become an important part of healthcare. AI systems are helping doctors to examine and search for diseases, medication research, and discovering new drugs. For example, AI systems can examine some medical images such as X-rays to search for the possibility of having cancer.
2. Manufacturing: AI has helped a lot in different manufacturing processes. For example, automation which is giving a specific task for machines to perform without the interference of humans. Also, they are used to giving certain warnings and suggestions in unusual circumstances.
3. Banking and finance: AI systems are used in this field to detect fraud actions, assessing risks or the possibility for risks occurring, serving customers, and suggesting strategies for investments.
4. Gaming: AI has been an important part of the gaming industry. Algorithms in this field enabled AI to act as a normal human player and is able to react in any circumstances in games against real humans.
5. Transportation: AI systems are helping a lot in the field of cars and transportation. It is used to suggest better routes for drivers, avoid accidents and traffic. Also, self-driving vehicles have become a new and important application of AI systems, as it includes machine learning and computer vision, to make spontaneous decisions and to navigate itself.
6. **Advantages and disadvantages of AI systems in healthcare:**

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| Advantages | Disadvantages |
| AI systems can analyze medical images and assists doctors to diagnose a certain disease accurately. | Using AI in healthcare systems requires access to sensitive information’s about the patients. Which might cause a breach and get the information’s stolen, which compromises the patient’s privacy. |
| AI systems can use huge amounts of patient’s data to enhance its decisions making processes to provide recommendations to doctors, to help them make better decisions based on evidence on past experiences. | If there are no human judgment that is made by the healthcare professionals, it could lead to certain errors that might affect human lives. |
| AI is developing treatment for each patient individually depending on their condition, leading to better results in therapies. | Because AI nowadays lacks the ability to improve and learn exactly like humans, it makes people concerned of the errors that might happen especially in surgery cases. |

1. Ethical and security issues in the AI systems used in healthcare:

* Security issues:
* Data Breaches: AI systems in healthcare need to handle sensitive information’s about patients. Which might be a target for hackers to make unauthorized access to the data.
* Manipulation attacks: AI systems especially in healthcare can be vulnerable to this attack, where attackers can control these systems and change inputs to cause incorrect outputs which might affect the life of patients.
* Model poisoning: The AI systems could be manipulated during the training phase by injecting malicious contents and biased data. This can lead to make bad predictions which affects the decision making.
* Lack of data integrity: the data that is being given to the AI system to be train might contain inaccurate data, or incomplete.
* Ethical issues
* Using AI in the fields of healthcare, especially if they show better results during time than healthcare professionals, might cause the AI to take their place. Which raises an ethical concern. Especially that it will affect the relationship between doctors and patients and the quality of care.
* The lack of explaining: AI models such as deep learning makes their decisions without making explanations, which raises a question of wither these systems should be trusted or not. especially that healthcare field is very sensitive.

1. Technical challenges in AI systems used in healthcare:

* The Quality and the Quantity of data: AI systems normally in many fields require massive amounts of data to be used as a trustworthy part. Especially in healthcare, it needs massive amounts of high-quality data to train the model on to be trusted, especially that humans’ life depends on its decisions. Obtaining this kind of data is very difficult and needs a lot of searching.

* Data preprocessing and data cleaning: the data gathered to be used for healthcare systems needs to be highly preprocessed and cleaned to remove outliers, noisy data, and errors. This needs a lot of resources, high quality machines, and processes, which are time and money consuming.
* Many of the AI models use deep learning which are known as black box. The term shows that it is unknown how these models work due to their complexity. Which makes it hard to explain and understand how these AI models work. Knowing how they work is important in fields like healthcare.
* AI systems that work in fields such as healthcare need to make a real-time process on the data to make useful decisions. Ensuring real-time outcomes can be challenging, especially when working with huge complex data.

1. Users and organizations implications from AI systems:

* Implications for users:
* Reliability and Accuracy of the systems: The ethical and technical issues mentioned before can affect the accuracy and reliability of the system, which leads to incorrect results, treatments, and all healthcare decisions. Which causes a risk to the patient’s life.
* Privacy and data protection: users might have concerns about the integrity of their private data. As data breaches can leak patients’ data which loses trust in these systems.
* Bias in data affects treatment on patients: if the AI systems were trained on biased data, it might lead to unequal treatment between patients, or different results on the same cases. Which would be positive for some and life threatening for others.
* Implications for organizations:
* Keeping up with the Law and Regulations: ethical and technical issues can lead to legal consequences, especially if the organization didn’t follow data protection laws, or it used biased algorithms. It could lead to fines, and loss of people’s trust.
* Reputation risk: having technical issues in the system might damage the organization’s reputation, losing user’s trust, loyalty of customers, and partnership.

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