# **Part 1:**

## **1.1:**

1.1: Differences between AI, ML, and DL.

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| **###########** | **AI** | **Machine Learning** | | | **Deep Learning** |
| Definition | The science of making machines able to mimic human behaviors. ML and DL are subsets of AI. | The science of training computers on some data so they learn from it and make predictions based on the data | | | The science of mimicking the human brain by applying neural networks to detect patterns in large unstructured data |
| What is it used for | Can be used to make machines complete specific tasks or for future planning | Can be used to predict future data based on previous data | | | Can be used to complete complex tasks, like object detection |
| Benefits | AI reduces human error and can be available anytime it is needed | ML gives accurate predictions and recognizes trends | | | DL handles unstructured data and gives high accuracy in its applications |
| Drawbacks | Increases laziness, and unemployment | Can give low accuracy in predictions because of overfitting or having outliers | | | Takes a huge amount of data and requires a very long time to work and is more expensive |
| The time needed to perform tasks | AI nowadays is Weak AI which can perform simple tasks that take lesser time than ML and DL | It takes less time for training models and requires lower labeled data than DL | | | Training the model takes longer than ML and DL requires massive amounts of labeled data. |
| Procedures | #######  #######  #######  ####### | | Input  Feature extraction  Classification  Output | Input  Feature extraction + classification  Output | |

1.1: AI definition.

AI is the science of making machines intelligent by mimicking human behaviors by using data and algorithms. It is one of the new science and engineering fields. The name itself was formed in 1956 and working with AI started after World War II. The first showcase of intelligent systems was the Turing test which happened in 1950, it was created by Alan Turing and the whole concept of the test was to ask intelligent systems questions that would be normal to ask humans, then a human and the system would answer the same question. And the answers would be compared. AI started improving and getting more accurate to human behaviors in the 1980s when Machine Learning algorithms started appearing and they focus on training intelligent systems on previous data and predicting future results. And in the 2010s Deep Learning, a new form of strong AI, started being used in different sections of the industry. It works by using neural networks to mimic the human brain so machines can replicate human emotions.

The evolution of AI to reach the stage it is nowadays was because of multiple reasons. The evolution in algorithms and tools enhanced AI’s performance over the years. The consistency of challenges and the use of big data with its features also improved the evolution of artificial intelligence.

1.1: Big Data and its features.

Big data is a term that defines huge amounts of different types of data such as images, videos, texts, and many more types. It is produced with different features such as high volume, high velocity, high variety, high veracity, and high value. Each has its different meanings.

High volume defines the number of terabytes in the generated data.

High velocity compares the speed of the data that the users generate.

High variety explains the types of data that can be generated, whether it is structured or unstructured data. Such as photos, videos, and texts.

High veracity defines the quality and trustworthiness of the data generated and collected.

High value describes the value of the generated data because not all generated data maintain a value, some data are just either duplicated or not needed.

New types of data such as images, videos, and text differ from traditional data in several ways. Since images, videos, and text are unstructured data the processing and volume of them might be different from traditional data which is defined by structured data. It also may take more time due to its complex design and its volume. Videos are a great example of high-volume data since a 20-minute video can be ranged between 500MB and 800MB.

## **1.2:**

1.2: Definition of Weak AI and Strong AI:

Artificial Intelligence is split into two types depending on how powerful it is; Weak AI, and Strong AI.

Weak AI: Weak artificial intelligence is the form of AI that our technology nowadays belongs to. It consists of machines that perform specific tasks required by them, such as Apple’s Siri and Amazon’s Alexa. The weak AI can improve overtime and become a stronger version.

Strong AI: Strong artificial intelligence is a stronger form than weak AI, it is a stage that we are yet to reach in development, and it focuses on making machines and humans equal in performing tasks and planning for the future. Such as Deep Blue, which defeated the world champion of chess in 1997.

## **1.3:**

1.3: Contributions of AI systems and their roles in some of the areas of our lives:

AI contributes to many areas of our daily lives, such as healthcare, banking, entertainment, gaming and more. Some of the AI systems already exist in some of these areas.

**Healthcare:** The medical field has become one of the most efficient fields in the world especially when AI started taking place in it, some of the existing systems in healthcare are disease prediction and virtual assistants that help doctors in some hard surgeries and operations.

Disease predictions are often used in cancer diagnosis predictions, since the systems can analyze patient data such as symptoms and medical history, which can identify patterns and usually offer recommendations. That way it can give higher accuracy in predictions.

**Manufacturing:** AI systems have high contributions when it comes to manufacturing and some AI systems help in decision making especially when it comes to huge amounts of data in a specific big company. AI systems can use these huge amounts of data and analyze them and make some data analytics operations which can show some good correlations between some factors in the data, which can help support decision-making processes.

**Banking:** For banks, AI systems can help the financial side of the industry by collecting data and analyzing the data and predicting future needs and stock market prices. Banks can also detect some fraud activity when doing bank transactions, by training an AI system on how transactions work and then listing every possible result that transactions give, that way if there’s a different result it can be seen as fraud and stop its transaction process.

**Entertainment:** For entertainment, AI systems have existed for a long time to know that they work the way they’re intended to work. Such as post recommendations in social media. The way recommendations work is by collecting data and analyzing it whether it is from Twitter or Facebook or any Blog, then the AI systems identify the patterns of latest trends and activities, that way it can predict what every user can be interested in.

**Gaming:** Every game has its own AI system that distinguishes it from other systems. Some examples on these AI systems are the NPCs (Non-player characters) in games. Their behavior revolves around the player that the user controls. They provide a challenging atmosphere for the users, and they make the game more challenging; they might even get more powerful depending on how the user advances in the game itself. The better the NPC programming is, the more users it will attract to buy the game. Which will increase its revenue.

## **1.4:**

1.4: Advantages and Disadvantages of the Disease Detection AI system

The disease detection AI system has many advantages that add to organizations, but it comes with risks and limitations to the organizations and for humans.

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| **Advantages** | **Disadvantages** |
| It detects early diseases which can be beneficial for patients because they can get treated successfully and faster | The AI systems may be concerning because the data included in them is very sensitive and can create problems if put in the wrong hands |
| The AI system can handle huge amounts of data included in it, which can cover most of the rare illnesses and organizations can use this knowledge to contribute to the medical field by a mile. | Some rare diseases may not be detected due to lack of information about the rare diseases included in the system which would discourage patients from using the AI systems if they fear having a rare disease. |
| The disease detection AI system is faster than humans in detecting illnesses which can benefit in timely treatments | AI systems regarding disease detection can be very costly and expensive to implement because of all the resources it needs, from ML infrastructure to huge rounds of training |

## **1.5:**

1.5: Security and ethical problems that organizations face using the AI system.

Using the disease detection Artificial intelligence system, organizations may face some security and ethical concerns regarding the use of it. Such as:

* Some organizations may have security concerns about training and inserting wrong data to the model, since patient medical information and history are very sensitive, and training the model on different data can result in predicting wrong diseases for the patients.
* Some ethical issues may contain organizations using this AI system to make money from selling patient information without their permission. Patients should have full control over their data, and organizations using this data for their benefit should be considered illegal.
* Many organizations would feel unsafe about their AI system information getting leaked to the public and they would start enhancing the security of their infrastructure so the confidentiality and integrity of the AI system can be protected from outsider threat. This may lead to a distrusting atmosphere inside the organization and may lead to lowering organizational performance overall.

## **1.6:**

1.6: Technical challenges that the disease detection AI system may face:

* The AI system may be trained on different patient information and medical history, which may lead to false predictions of diseases, and low accurate diagnosis for patients.
* Since it is an AI system, it is bound to make mistakes, since the accuracy is never 100%, and predictions depend on patients’ information which vary from patient to patient.
* Since the medical field never stops expanding, and new diseases are discovered each day, training the AI system may be a bit hard because gathering information about new diseases may be hard. And predicting these new diseases may be difficult.
* It takes massive amounts of storage to have records of every disease there is, and since some of the disease symptoms are similar, it may select a wrong disease, due to overfitting information on the wrong disease.

## **1.7:**

1.7: How can security and ethical and technical Issues affect users and organizations.

The security and ethical issues and the technical issues mentioned above can affect the users and organizations that encounter the issues negatively, for example:

* If organizations are selling patient information without the patient’s confirmation, it may result in the user losing its trust in the organization which would spread negative news about the organization and will lead to its reputation damaged.
* If the AI system predicted a false disease for the user, wrong medication might be given which would affect the user’s life and would cause internal damage and death.
* Recording every disease information would require a lot of resources, such as massive amounts of data and storage devices. Implementing them would cost the organization a lot of money and time to find a huge amount of information regarding every disease possible.
* If the user has a rare disease that the AI system wasn’t yet trained to predict, it may result in giving wrong medication and would lead to losing the trust of the user in the organization.
* The organization would require constant monitoring for newly discovered diseases, and they would require massive amounts of information regarding the diseases which would cost money and time and would exhaust the employees in the organization. Not having enough information about the new diseases may impact the reputation of the organization negatively.