

Introduction to Emerging Technologies (CoSc1012)

Compiled By Faculty of Informatics
Course Coordinators

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Chapter 1: Introduction to Emerging Technologies

- **Evolution of Technologies**
 - Introduction to the Industrial Revolution (IR)
 - The Most Important Inventions of the Industrial Revolution
 - Historical Background (IR 1.0, IR 2.0, IR 3.0)
- **Role of Data for Emerging Technologies**
- **Enabling devices and network (Programmable devices)**
 - List of some Programmable devices
- **Human to Machine Interaction**
 - Disciplines Contributing to Human-Computer Interaction (HCI)
- **Future Trends in Emerging Technologies**
 - Emerging technology trends in 2019
 - Some emerging technologies that will shape the future of you and your business

- **Emerging technology** is a term generally used to describe a **new technology**, but it may also refer to the **continuing development of existing technology**;
- It can have slightly different meanings when used in different areas, such as media, business, science, or education.
- The term commonly refers to **technologies that are currently developing**, or that are expected to be available within the **next five to ten years**, and is usually reserved for technologies that are creating or are **expected to create significant social or economic effects**.
- **Technological evolution** is a theory of radical transformation of society through technological development.

What is the root word of technology and evolution?

- **Technology**: 1610s, “discourse or treatise on an art or the arts,” from Greek **tekhnologia**” systematic treatment of an art, craft, or technique,” originally referring to grammar, from **tekhnō-** (see techno-) + -logy.
- **Evolution**: evolution means the process of developing by gradual changes.

- **List of some currently available emerged technologies**
 - Artificial Intelligence
 - Blockchain
 - Augmented Reality and Virtual Reality
 - Cloud Computing
 - Angular and React
 - DevOps
 - Internet of Things (IoT)
 - Intelligent Apps (I-Apps)
 - Big Data
 - Robotic Processor Automation (RPA)

- The **Industrial Revolution** was a period of major industrialization and innovation that took place during the late 1700s and early 1800s.
- An Industrial Revolution at its core occurs when a society shifts from using tools to make products to use new sources of energy, such as coal, to power machines in factories.
- The revolution started in **England**, with a series of innovations to make **labor** more **efficient** and **productive**.
- The Industrial Revolution was a time when the **manufacturing of goods** moved from **small shops and homes** to **large factories**.
- This shift brought about changes in culture as people moved from rural areas to big cities in order to work.

- The **American Industrial Revolution** commonly referred to as the **Second Industrial Revolution**, started sometime between 1820 and 1870.
- The impact of **changing the way items was manufactured** had a wide reach.
- Industries such as textile **manufacturing, mining, glass making, and agriculture** all had undergone changes.
- From the first industrial revolution (mechanization through water and steam power) to the mass production and assembly lines using electricity in the second, the fourth industrial revolution will take what was started in the third with the adoption of computers and automation and enhance it with smart and autonomous systems fueled by data and machine learning.
- Generally, the following industrial revolutions fundamentally changed and transfer the world around us into modern society.
 - The steam engine,
 - The age of science and mass production, and
 - The rise of digital technology
 - Smart and autonomous systems fueled by data and machine learning.

- **Transportation:** The Steam Engine, The Railroad, The Diesel Engine, The Airplane.
- **Communication:** The Telegraph. The Transatlantic Cable. The Phonograph. The Telephone.
- **Industry:** The Cotton Gin. The Sewing Machine. Electric Lights.

- The industrial revolution began in Great Britain in the late 1770s before spreading to the rest of Europe.
- The first European countries to be industrialized after England were Belgium, France, and the German states.
- The final cause of the Industrial Revolution was the effects created by the Agricultural Revolution.
- As previously stated, the Industrial Revolution began in Britain in the 18th century due in part to an increase in **food production**, which was the key outcome of the Agricultural Revolution.
- The four types of industries are:
 - The **primary industry** involves getting raw materials e.g. mining, farming, and fishing.
 - The **secondary industry** involves manufacturing e.g. making cars and steel.
 - **Tertiary industries** provide a service e.g. teaching and nursing.
 - The **quaternary industry** involves research and development industries e.g. IT.

- The Industrial Revolution (IR) is described as a **transition to new manufacturing processes**.
- IR was first coined in the 1760s, during the time where this revolution began.
- The transitions in the **first IR**(IR 1.0) included
 - going from hand production methods to machines,
 - the increasing use of steam power (see Figure below),
 - the development of machine tools and the rise of the factory system.

- IR 2.0, also known as the **Technological Revolution**, began somewhere in the 1870s.
- The advancements in IR 2.0 included
 - the development of **methods for manufacturing** interchangeable parts and
 - widespread adoption of pre-existing technological systems such as **telegraph** and **railroad networks**. This adoption allowed the vast movement of people and ideas, enhancing communication.
 - Moreover, new technological systems were introduced, such as electrical power (see Figure below) and telephones.

- IR 3.0 introduced the transition from **mechanical** and **analog electronic** technology to **digital electronics** (see Figure on the next slide) which began from the late 1950s.
- Due to the shift towards **digitalization**, IR 3.0 was given the nickname, “**Digital Revolution**”.
- The core factor of this revolution is the **mass production** and widespread use of **digital logic circuits** and its derived technologies such as the **computer**, **handphones** and the **Internet**.
- These technological innovations have arguably transformed traditional production and business techniques **enabling people to communicate with another without the need of being physically present**.
- Certain practices that were enabled during IR 3.0 is still being practiced until this current day, for example – the proliferation of **digital computers** and **digital record**.



- Now, with advancements in various technologies such as robotics, Internet of Things, additive manufacturing and autonomous vehicles, IR 4.0 was coined by Klaus Schwab, in the year 2016.
- The technologies mentioned above are what you call – cyber-physical systems.
- A cyber-physical system is a mechanism that is controlled or monitored by computer-based algorithms, tightly integrated with the Internet and its users.

- One example that is being widely practiced in industries today is the usage of Computer Numerical Control (CNC) machines.
- These machines are operated by giving it **instructions using a computer.**
- Another major breakthrough that is associated with IR 4.0 is the adoption of Artificial Intelligence (AI),
- **AI** is also one of the main elements that give life to **Autonomous Vehicles and Automated Robots.**



- **Data** is regarded as the **new oil** and **strategic asset** since we are living in the age of big data, and drives or even determines the future of science, technology, the economy, and possibly everything in our world today and tomorrow.
- Data have not only triggered tremendous hype and buzz but more importantly, presents enormous challenges that in turn bring incredible innovation and economic opportunities.
- This reshaping and paradigm-shifting are driven not just by data itself but all other aspects that could be created, transformed, and/or adjusted by understanding, exploring, and utilizing data.
- The preceding trend and its potential have triggered new debate about **data-intensive scientific discovery as an emerging technology**, the so-called “fourth industrial revolution,”

- There is no doubt, nevertheless, that the potential of data science and analytics to enable data-driven theory, economy, and professional development is increasingly being recognized.
- This involves not only core disciplines such as computing, informatics, and statistics, but also the broad-based fields of business, social science, and health/medical science.

- In the world of digital electronic systems, there are **four** basic kinds of devices: **memory**, **microprocessors**, **logic**, and **networks**.
- **Memory** devices store random information such as the contents of a spreadsheet or database.
- **Microprocessors** execute software instructions to perform a wide variety of tasks such as running a word processing program or video game.
- **Logic** devices provide specific functions, including device-to-device interfacing, data communication, signal processing, data display, timing and control operations, and almost every other function a system must perform.
- The **network** is a collection of computers, servers, mainframes, network devices, peripherals, or other devices connected to one another to allow the sharing of data.
- An excellent example of a network is the **Internet**, which connects millions of people all over the world

❑ Why is a computer referred to as a programmable device?

- Because what makes a computer a computer is that it follows a set of instructions.
- Many electronic devices are computers that perform only one operation, but they are still following instructions that reside permanently in the unit.

- A full range of network-related equipment referred to as **Service Enabling Devices** (SEDs), which can include:
 - Traditional channel service unit (CSU) and data service unit (DSU)
 - Modems
 - Routers
 - Switches
 - Conferencing equipment
 - Network appliances (NIDs and SIDs)
 - Hosting equipment and servers

- ❑ **Human-machine interaction** (HMI) refers to the communication and interaction between a human and a machine via a user interface.
- Nowadays, natural user interfaces such as **gestures** have gained increasing attention as they allow humans to control machines through natural and intuitive behaviors
- ❑ **What is interaction in human-computer interaction?**
- HCI (human-computer interaction) is the study of how people interact with computers and to what extent computers are or are not developed for successful interaction with human beings.
- As its name implies, HCI consists of **three** parts: the **user**, the **computer** itself, and the **ways they work together**.

❑ How do users interact with computers?

- The user interacts directly with hardware for the human input and output such as displays, e.g. through a **graphical user interface**.
- The user interacts with the computer over this software interface using the given input and output (I/O) hardware.

❑ How important is human-computer interaction?

- The goal of HCI is to improve the interaction between users and computers by making computers **more user-friendly and receptive to the user's needs**.
- The main advantages of HCI are **simplicity, ease of deployment & operations and cost savings** for smaller set-ups.
- They also **reduce solution design time** and integration complexity.

Cognitive psychology: Limitations, information processing, performance prediction, cooperative working, and capabilities.

Computer science: Including graphics, technology, prototyping tools, user interface management systems.

Linguistics.

Engineering and design.

Artificial intelligence.

Human factors.

- **Emerging technology trends in 2019**
 - 5G Networks
 - Artificial Intelligence (AI)
 - Autonomous Devices
 - Blockchain
 - Augmented Analytics
 - Digital Twins
 - Enhanced Edge Computing and
 - Immersive Experiences in Smart Spaces

- The future is now So emerging technologies are taking over our minds more and more each day.
- These are very high-level emerging technologies though they sound like tools that will only affect the **top tier of** technology companies who employ the world's top **1% of geniuses**.
- This is totally wrong. **Chatbots, virtual/augmented reality, blockchain, Ephemeral Apps and Artificial Intelligence** are already shaping your life whether you like it or not.
- At the end of the day, you can either adapt or die.

End of Chapter 1

Chapter 2: Data Science

At the end of this chapter student should be able to :

- Describe what data science is and the role of data scientists.
- Differentiate data and information.
- Describe data processing life cycle .
- Understand different data types from diverse perspectives.
- Describe data value chain in emerging era of big data.
- Understand the basics of Big Data.
- Describe the purpose of the Hadoop ecosystem components.

- Overview of data science
- Data Processing Cycle
- Data types and their representation
- Data value Chain
- Basic concepts of big data

What is data science?

- It is a multi-disciplinary field that uses scientific methods, processes, algorithms, and systems to extract knowledge and insights from structured, semi-structured and unstructured data.
- Data science is much more than simply analyzing data.
- It is used to create data-centric artifacts and applications that address specific **scientific, socio-political, business, or other issues**.
- It offers a range of roles and requires a range of skills.
 - Mathematics
 - Statistics
 - Data engineering
 - Visualization
 - Advanced computing

- **Data** are available in various form (structure & unstructured) and these days generated in bulk from different source , essentially free and ubiquitous data.
- The granularity, size and accessibility data, comprising both physical, social, commercial and political spheres has exploded in the last decade or more.
- **Simple tools are not capable of processing this huge volume and variety of data.**
- The ability to take data—to be able to understand it, to process it, to extract value from it, to visualize it, to communicate it—that's going to be a hugely important skill, not only at the professional level but even at the educational level for elementary school kids, for high school kids, for college kids.

That is Why???

Three components of Data Science:

Data science consists of three components, that is, organizing, packaging and delivering data (OPD of data).

1. Organizing the data:

Organizing is where the planning and execution of the physical storage and structure of the data takes place after applying the best practices in data handling.

2. Packaging the data:

Packaging is where the prototypes are created, the statistics is applied and the visualisation is developed. It involves logically as well as aesthetically modifying and combining the data in a presentable form.

3. Delivering the data:

Delivering is where the story is narrated and the value is received. It makes sure that the final outcome has been delivered to the concerned people.

Phase 1: understand the various specifications, requirements, priorities and required budget. Ask the right questions : about the required resources present in terms of people, technology, time and data to support the project. need to frame the business problem and formulate initial hypotheses (IH) to test.

Phase 6 : evaluate whether the goal that has planned in the first phase is achieved. identify all the key findings, communicate to the stakeholders and determine if the results of the project are a success or a failure based on the criteria developed in Phase 1.

Phase 5: deliver final reports, briefings, code and technical documents. a pilot project is also implemented in a real-time production environment. This will provide you a clear picture of the performance and other related constraints on a small scale before full deployment.

Phase 4: develop datasets for training and testing purposes. Decide whether your existing tools will suffice for running the models or it will need a more robust environment (like fast and parallel processing). analyze various learning techniques like classification, association and clustering to build the model.

Phase 2: you require analytical sandbox in which you can perform analytics for the entire duration of the project. You need to explore, preprocess and condition data prior to modeling. You will perform ETLT (extract, transform, load and transform) to get data into the sandbox.

Phase 3 determine the methods and techniques to draw the relationships between variables. These relationships will set the base for the algorithms which you will implement in the next phase. apply Exploratory Data Analytics (EDA) using various statistical formulas and visualization tools.

What is the question/problem?
Who wants to answer/solve it?
What do they know/do now?
How well can we expect to answer/solve it?
How well do they want

Where will it be hosted?
Who will use it?
Who will maintain it?

What data is available?
Is it good enough?
Is it enough?
What are sensible
measurements to derive from
this data? Units,
transformations, rates, ratios,
etc.

What kind of problem is it?
E.g., classification,
clustering, regression, etc.
What kind of model should I
use?
Do I have enough data for
it?
Does it really answer the
question?

Again, what are the measurements that
tell the real story?
How can I describe and visualize them
effectively?

Did it work? How well?
Can I interpret the model?
What have I learned?

- A Data Scientists in simple words is one who **practices** the art of Data Science
- Data scientists are those who **crack complex data problems** with their strong expertise in **certain** scientific disciplines.
- They work with several elements related to mathematics, statistics, computer science, and their **domain** (though they may not be an expert in all these fields).
- **Data Scientist should be very strong in any of these skills**

What is data?

- Data can be defined as a representation of facts, concepts, or instructions in a formalized manner, which should be suitable for communication, interpretation, or processing, by human or electronic machines.
- It is **unprocessed** facts and figures represented with the help of characters such as alphabets (A-Z, a-z), digits (0-9) or special characters (+, -, /, *, , =, etc.) and picture ,sound and video.
- **Information** is the processed data on which decisions and actions are based

Data

PROCESSING

Information

- The collection and manipulation of items of data to produce meaningful information
- Data processing is the re-structuring or re-ordering data to increase its usability
- Data processing cycle is a sequence of steps or operations for processing data to make it usable format

- | | | |
|---|---|---|
| <ul style="list-style-type: none">• Collection of raw data needs to be fed in the cycle for processing.• The first step and called input | <ul style="list-style-type: none">• Manual , electronic data processing, mechanical processing or automated means | <ul style="list-style-type: none">• Outcome.• Processed & meaning full data• the data is useful and provides information. |
|---|---|---|



- Data can be available in different format and can be described from different perspectives.
- **Data type** is simply an attribute of data that tells the compiler or interpreter how the programmer intends to use the data.
- **Metadata** (Data about Data) is a data that provide additional information about a specific set of data.
 - It is not a separate data structure.
- Data types can be categorized from programming perspective as follows:
 - **Integers(int)**- is used to store whole numbers, mathematically known as integers
 - **Booleans(bool)**- is used to represent restricted to one of two values: true or false
 - **Characters(char)**- is used to store a single character
 - **Floating-point numbers(float)**- is used to store real numbers
 - **Alphanumeric strings(string)**- used to store a combination of characters and numbers

There are three categories of data types from analytics perspective.

- **Structured data** – Relational data.

Name	Sex	Age	Result	Status
Abebe	M	24	90	Pass
Almaz	F	22	93	Pass

- **Semi Structured data** – XML data.

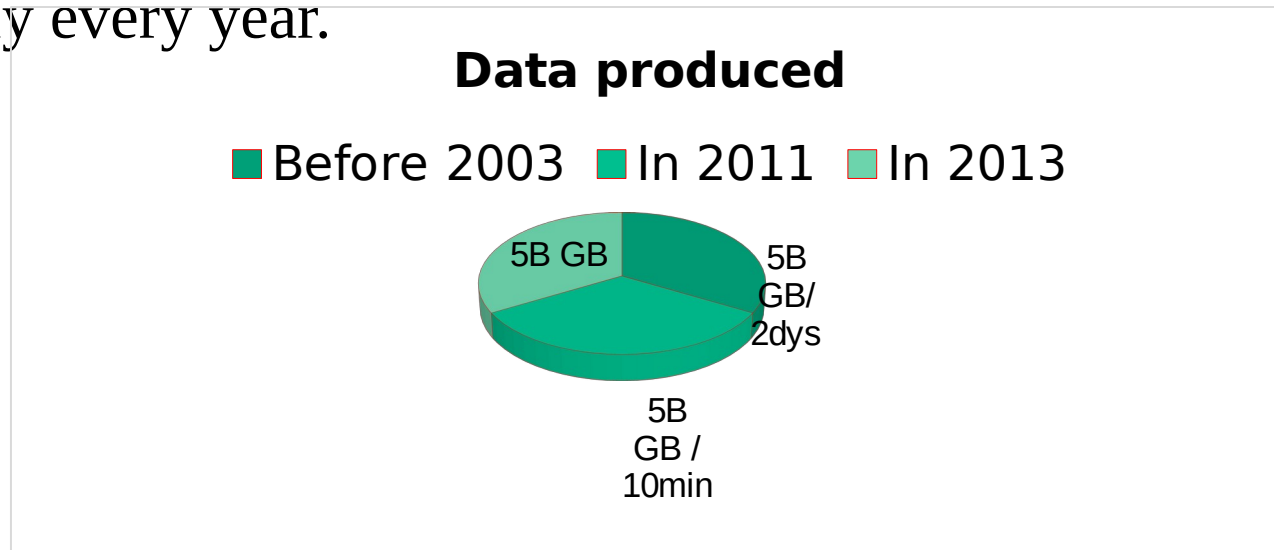
```
<student><name> Abebe</name>  
<sex>Male</sex>  
<age>24</age>  
<Result>90</Result>  
<Status>Pass</Status></student>
```

```
<student><name> Abebe</name>  
<sex>Male</sex>  
<age>24</age>  
<Result>90</Result>  
<Status>Pass</Status></student>
```

- **Unstructured data** – Word, PDF, Text, Media

- Data Value Chain is a series of activities that introduce information flow within a big data system needed to generate value and useful insights from data.
- The Big Data Value Chain identifies the following key high-level activities:

- Due to the advent of new technologies, devices, and communication means like social networking sites, IoT and soon the amount of data produced by mankind is growing rapidly every year.



The amount of data produced by us

If this data is stored inside disks and pile up them, it may fill an entire football field

What Is Big Data?

- Big data is a large and complex collection of data sets that is difficult to process using on-hand database management tools or traditional data processing applications.

Sources of Big data.

Stock Exchange Data

Black Box Data

- Very difficult to process and store it in the traditional method of data storage and processing with one computer.
- It is also characterized by 3V and more
 - Volume: large amounts of data Zeta bytes/Massive datasets
 - Velocity: Data is live streaming or in motion
 - Variety: data comes in many different forms from diverse sources
 - Veracity: can
- It use cluster computing and distributed storage
 - Storage and processing is done on multiple computers



- **Resource Pooling:** Combining the available storage space in different machine to hold data is a clear benefit, but CPU and memory pooling are also extremely important. Processing large datasets requires large amounts of all three of these resources.
- **High Availability:** Clusters can provide varying levels of fault tolerance and availability guarantees to prevent hardware or software failures from affecting access to data and processing. This becomes increasingly important as we continue to emphasize the importance of real-time analytics. 30 •
- **Easy :Scalability** Clusters make it easy to scale horizontally by adding additional machines to the group. This means the system can react to changes in resource requirements without expanding the physical resources on a machine.

Big data technologies are important in providing

- Helps to analyze huge data which are available in various form and stored in distributed machines.
- It gives more accurate analysis that will lead to more concrete decision-making resulting.
- It has greater operational efficiencies,
- It reduced storage and processing cost
- It reduced risks for the business by using distributed computing and storage.
- Doest require powerful and special machine for data processing and storage
- It only require an infrastructure that can manage and process huge volumes different data type
 - structured and
 - unstructured data in real time and
 - can protect data privacy and security.
- There are various technologies in the market from different vendors including Amazon, IBM, Microsoft, etc., to handle big data.

Traditional Approach

- One computer to store and process
- Select DBMS tool
Oracle, SQL...
- Use interact with the app
- Works on less volume
- Single point of failure
- Not scalable

Google's Solution

Parallel storage & Processing

Use MapReduce

- divide task into small part
- Assign each part to d/t PC
- Collect result from each PC & integrate

Hadoop

Parallel storage & Processing

Use MapReduce

- divide task into small part
- Assign each part to more PC
- Collect result from each PC & integrate

- Apache Hadoop is a free, open-source framework that can manage and store tons and tons of data. It provides distributed computing of massive data sets over a cluster of 1000s of computers. It is used for high-level computations
- Here's a list of features of Apache Hadoop:
- Effectively scale large data on thousands of Hadoop clusters
- It uses the Hadoop Distributed File System (HDFS) for data storage which distributes massive amounts of data across several nodes for distributed, parallel computing
- Provides the functionality of other data processing modules, such as Hadoop MapReduce, Hadoop YARN, and s
- and data processing.

- Fraud and Risk Detection
- Healthcare
- Internet Search
- Targeted Advertising
- Website Recommendations

- Advanced Image Recognition
- Speech Recognition
- Airline Route Planning
- Gaming
- Augmented Reality

End of Chapter 2

Chapter 3: Artificial Intelligence (AI)

Introduction to AI

What is AI

- History of AI
- Levels of AI
- Types of AI

Applications of AI

- Agriculture o Health
- Business (Emerging market)
- Education

AI tools and platforms (eg: scratch/object tracking)

Sample application with hands on activity (simulation based)

❑ Artificial Intelligence (afterwards call it as **AI**) is composed two words: **Artificial** and **Intelligence**.

AI=Artificial + Intelligence

❑ Artificial defines as “**man-made**” and Intelligence defines the “**thinking power**” or “the ability to learn and solve problems” .

❑ There fore, AI means *"a man-made thinking power."*

❑ So AI defined as: *"It is a branch of Computer Science by which we can create intelligent machines which can behave like **a human, think like humans, and able to make decisions.**"*

- ❑ Reasoning

- ❑ Learning

- ❑ Problem Solving

- ❑ Perception

- ❑ Linguistic Intelligence

- AI system composed of **agent** and its **environments**.

- An agent is anything that can:

- ❑ Perceive its environment through sensors.

- ❑ Acts upon that environment through effectors.

- **Intelligent agents** must be able to set goals and achieve them.
- Machine perception is the ability to use input from sensors (**such as cameras, microphones, sensors, etc.**) to deduce aspects of the world. e.g., *Computer Vision*.

- ✓ Autonomous vehicles (such as drones and self-driving cars)
- ✓ Medical diagnosis.
- ✓ Creating art (such as poetry).
- ✓ Proving mathematical theorems.
- ✓ Playing games (such as Chess or Go).
- ✓ Search engines (such as Google search).

- ✓ Online assistants (such as Siri, Google Assistance, Alexa, Cortana etc.).
- ✓ Image recognition in photographs.
- ✓ Spam filtering.
- ✓ Prediction of judicial decisions.
- ✓ Targeting online advertisements

- Open Google Assistant from your smart phone
- Next speak the following terms and investigate the result from the Google Assistant
 - Call 994
 - Call 0939999565
 - Open camera
 - Open telegram
 - Open Facebook

AI needed to:

- ❑ Create expert systems.
- ❑ Helping machines to find solutions for complex problems.

Goal of AI

The main goals of AI are:

- ❑ Replicate human intelligence
- ❑ Solve Knowledge-intensive tasks
- ❑ An intelligent connection of perception and action

- ❑ Building a machine which can perform tasks that requires human intelligence.
- ❑ Creating system which can exhibit intelligent behavior, learn new things by itself, demonstrate, explain, and can advise to its user.

AI requires the following disciplines :

Mathematics

Biology

Psychology

Sociology

Computer Science

Neurons Study

Statistics

Advantage of AI are:

- ☐ High accuracy with fewer errors.
- ☐ High speed.
- ☐ High reliability.
- ☐ Useful for risky areas.
- ☐ Digital Assistant.
- ☐ Useful as a public utility.

- ❑ High cost.
- ❑ Can't think out of the box.
- ❑ No feeling and emotions.
- ❑ Increase dependence on machines.
- ❑ No original creativity.



- *Read about History of AI from page 41-44 of your module and other AI related materials.*
- *Summarize it and prepare a PowerPoint not less than 10 and not more than 12 slides.*
- *Present it to your classmates.*

Seven levels of AI:

Stage 1 – Rule-Based Systems.

Stage 2 – Context Awareness and Retention.

Stage 3 – Domain-Specific Expertise.

Stage 4 – Reasoning Machines.

Stage 5 – Self Aware Systems / Artificial General Intelligence (AGI).

Stage 6 – Artificial Super Intelligence (ASI).

Stage 7 – Singularity and Transcendence.

- The most common uses of AI today fit in this bracket.
- Covering everything from business software (Robotic Process Automation) and
- Domestic appliances to aircraft autopilots.

- Algorithms that develop information about the specific domain they are being applied in.
- They are trained on the knowledge and experience of the best humans.
- Their knowledge base can be updated as new situations and queries arise.

Example:

- Chatbots and “Roboadvisors”.

- Going beyond the capability of humans
- These systems build up expertise in a specific context taking in massive volumes of information which they can use for decision making.

Example:

Cancer diagnosis, Google Deepmind's AlphaGo

- These algorithms have some ability to attribute mental states to themselves and others
- They have a sense of beliefs, intentions, knowledge, and how their own logic works.
- They could reason or negotiate with humans and other machines.
- At the moment these algorithms are still in development, however, commercial applications are expected within the next few years.

- These systems have human-like intelligence
- The most commonly portrayed AI in media
- It is the goal of many working in AI and some believe it could be realized already from 2024.

- AI algorithms can outsmart even the most intelligent humans in every domain.
- Logically it is difficult for humans to articulate what the capabilities might be,
- yet we would hope examples would include solving problems we have failed to so far, such as world hunger and dangerous environmental change.

- This is the idea that development provided by ASI (Stage 6) leads to a massive expansion in human capability.
- Human augmentation could connect our brains to each other and to a future successor of the current **internet, creating a “hive mind”** that shares ideas, solves problems collectively, and even gives others access to our dreams as observers or participants. Pushing this idea further, we might go beyond the limits of the human body and connect to other forms of intelligence on the planet

animals, plants, weather systems, and the natural environment. Some proponents of singularity such as Ray Kurzweil, Google's Director of Engineering, suggest we could see it happen by 2045 as a result of exponential rates of progress across a range of science and technology disciplines. The other side of the fence argues that singularity is impossible and human consciousness could never be digitized.



- AI mainly divide based of capabilities and functions
- Based on Capabilities AI classified as:
 - ✓ Narrow(Weak) AI
 - ✓ General AI
 - ✓ Super (Strong) AI

Based on Function AI classified as:

- ✓ Reactive Machines
- ✓ Limited Memory
- ✓ Theory of Mind
- ✓ Self-Awareness

- The goal of many researchers is to create **strong** and **general** AI.
- These types of AI learns like a human and can solve general problems as the human brain does.
- To achieve this it requires many years.
- Intelligence or the cognitive process of human is composed of three main stages:
 - ❑ Observe and input the information or data in the brain.
 - ❑ Interpret and evaluate the input.
 - ❑ Make decisions

- AI is the science of simulating human thinking.
- Because of this it is possible to map human thinking to AI components.

Human Thinking

AI System

Acquire information

Interpreting and
evaluating the input
data.

Make decision

Sensing layer

Interpretation layer

Interacting layer

AI is influenced by :

- ❑ Big data: Structured data versus unstructured data
- ❑ Advancements in computer processing speed and new chip architectures
- ❑ Cloud computing and APIs
- ❑ The emergence of data science

- AI can solve complex problems in an efficient way in multiple industries
- some sectors which have the application of Artificial Intelligence
 - ✓ AI in agriculture
 - ✓ AI in Healthcare
 - ✓ AI in education:
 - ✓ AI in Finance and E-commerce
 - ✓ AI in Gaming
 - ✓ AI in Social Media
 - ✓ AI in Data Security
 - ✓
 - ✓ AI in Travel &Transport
 - ✓ AI in the Automotive Industry
 - ✓ AI in Robotics:
 - ✓ AI in Entertainment

- AI platforms are defined as some sort of hardware architecture or software framework , that allows the software to run.
- Artificial intelligence (AI) platforms provide users a tool kit to build intelligent applications
- Some platforms offer pre-built algorithms and simplistic workflows, others require a greater knowledge of development and coding

Some functionality of the algorithms are:

- Image Processing
- Natural language processing (information retrieval, text mining, question answering, machine translation ...etc)
- Voice recognition
- Recommendation system
- Predictive analytics

- ✓ Search and optimization
- ✓ Logic
- ✓ Probabilistic methods for uncertain reasoning
- ✓ Classifiers and statistical learning methods
- ✓ Neural networks
- ✓ Control theory
- ✓ Languages

1.Commuting

- Google's AI-Powered Predictions
- Ridesharing Apps Like Uber and Lyft
- Commercial Flights Use an AI Autopilot

2.Email

- Spam Filters
- Smart Email Categorization

3.Social Networking

4.Online Shopping

5.Mobile Use

- Voice-to-Text
- Smart Personal Assistants(Siri and Google Now)
- Alexa, an AI-powered personal assistant that accepts voice commands to create to-do lists, order items online, set reminders, and answer questions

End of Chapter 3