MODULE 1
Foundation & Design Principles of Cognitive Computing

Cognitive Computing:-
- Cognitive computing is the use of computerized models to simulate the human thought process in complex situations where the answers may be ambiguous and uncertain.
- Computers are faster than humans at processing and calculating, but they have yet to master some tasks, such as understanding natural language and recognizing objects in an image.
- Cognitive computing is an attempt to have computers mimic the way a human brain works.
- Cognitive computing makes use of artificial intelligence (AI) and other underlying technologies, including the following:
    1. Expert systems
    2. Neural networks
    3. Machine learning
    4. Deep learning
    5. Natural language processing (NLP)
    6. Speech recognition
    7. Object recognition
    8. Robotics

Uses of Cognitive Computing: -
Healthcare: Cognitive computing can deal with large amounts of unstructured healthcare data such as patient histories, diagnoses, conditions and journal research articles to make recommendations to medical professionals.
Cognitive technology expands a doctor's capabilities and assists with decision-making.

Retail: In retail environments, these technologies analyze basic information about the customer, along with details about the product the customer is looking at.
The system then provides the customer with personalized suggestions.

Banking and finance. Cognitive computing in the banking and finance industry analyzes unstructured data from different sources to gain more knowledge about customers. NLP is used to create chatbots that communicate with customers.

Logistics. Cognitive computing aids in areas such as warehouse management, warehouse automation, networking and IoT devices.

Advatages	Disadvantages
Analytical accuracy: Cognitive computing is proficient at juxtaposing and cross-referencing structured and unstructured data.	**Security challenges**: Cognitive systems need large amounts of data to learn from. Organizations using the systems must properly protect that data -- especially if it is health, customer or any type of personal data.
Business process efficiency: Cognitive technology can recognize patterns when analyzing large data sets.	**Long development cycle length:** These systems require skilled development teams and a considerable amount of time to develop software for them.
Customer interaction and experience:	**Slow adoption**: The slow development

A combination of cognitive assistants, personalized recommendations and behavioral predictions enhances customer experience.	lifecycle is one reason for slow adoption rates.
Employee productivity and service quality: Cognitive systems help employees analyze structured or unstructured data and identify data patterns and trends.	**Negative environmental impact:** The process of training cognitive systems and neural networks consumes a lot of power and has a sizable carbon footprint.

Difference between AI and CC

Artificial Intelligence	Cognitive Computing
Algorithm of AI generates the most accurate result without the utilization of human input.	Based on human input i.e. thinking, reasoning, and belief to generate output
AI is autonomous	Cognitive is dependent
It reflects the reality	It copies human behaviour
AI itself generates the algorithm to produce end results and decisions	It generates only the information and allows the end result to be interpreted by humans itself
Utilizes pre-trained algorithms	Utilizes prediction and analysis as a basic tool.
Retail, finance, and manufacturing security are a few areas that use AI	Enhances process across various fields viz. industries, customer service, health care
Technologies, where AI is utilized, are NLP, speech recognition, image processing, video analytics, chatbots	Cognitive shines when there is a need for sentiment analysis, facial recognition, fraud detection, risk assessment.

How cognitive computing works?

- Systems used in the cognitive sciences combine data from various sources while weighing context and conflicting evidence to suggest the best possible answers.
- To achieve this, cognitive systems include self-learning technologies that use data mining, pattern recognition and NLP to mimic human intelligence.
- Using computer systems to solve the types of problems that humans are typically tasked with requires vast amounts of structured and unstructured data fed to machine learning algorithms.
- Over time, cognitive systems are able to refine the way they identify patterns and the way they process data.
- They become capable of anticipating new problems and modeling possible solutions.
- For example, by storing thousands of pictures of dogs in a database, an AI system can be taught how to identify pictures of dogs.
- The more data a system is exposed to, the more it is able to learn and the more accurate it becomes over time.

CC have the following attributes:-
- **Adaptive**. These systems must be flexible enough to learn as information changes and as goals evolve.
- **Interactive**. Human-computer interaction is a critical component in cognitive systems.
- **Iterative and stateful.** Cognitive computing technologies can ask questions and pull in additional data to identify or clarify a problem.

- **Contextual**. Understanding context is critical in thought processes.