A.S.D.GOVERNMENT DEGREE COLLEGE FOR WOMEN (A)

Affiliated to Adikavi Nannaya University

Jagannaickpur, Kakinada.

DEPARTMENT OF COMPUTER SCIENCE

CREATIVE ASSIGNMENTS

2023-2024

A.S.D. GOVT. DEGREE COLLEGE FOR WOMEN (A)
Jagannaickpur, Kakinada

DEPARTMENT OF COMPUTER SCIENCE

Activity Register 2023-2024

Date	08-05-2024
Conducted through (DRC/JKC/ELF/NCC/NSS/ Departments etc.)	Department of Computer Science
Nature of Activity (Seminar/Workshop/Extn. Lecture etc.,)	Creative Assignments
Title of the Activity	**Presentations on Recent Technologies in Computer Science**
Name of the Department/Committee	**COMPUTER SCIENCE**
No. of students participated	10
Brief Report on the activity	To create awareness on latest trends and technologies in the field of Computer Science
Name of the Lecturers who Planned & conducted the activity	N. Naga Subrahmanyeswari
Signature of the Dept. In-Charge /Convener of the Committee	N.N.S. Eswari I/C CHARGE DEPT OF COMPUTER SCIENCE ASDGOVT DEGREE COLLEGE (W)(AUTONOMOUS) KAKINADA
Signature of the Principal	V.N.C. PRINCIPAL A.S.D.GOVT.DEGREE COLLEGE (W) AUTONOMOUS KAKINADA
Remarks	

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DEPARTMENT OF COMPUTER SCIENCE

CREATIVE ASSIGNMENTS

2023-2024

The Department of Computer Science had organized a Creative Assignments for III B.Sc.(M.P.Cs) students and they submitted a study report on Recent Technologies in Computer Science. The following students had participated in the activity on 08-05-2024.

S.No	Roll No.	Name of the Students	Group	Topic
1.	2132011	CHODISETTI VISHNU SRI	III B.Sc.(MPCS)	Big Data
2.	2132014	GUDA SHARON GRACE	III B.Sc.(MPCS)	Artificial Intelligence
3.	2132016	KARRI LAKSHMI LAVANYA	III B.Sc.(MPCS)	Ethical Hacking
4.	2132018	KARRI SATYA SOWJANYA	III B.Sc.(MPCS)	Block Chain Technology
5.	2132022	PALEPU DHANA JAYA	III B.Sc.(MPCS)	Robotics
6.	2132034	VAIDADI ARUNA	III B.Sc.(MPCS)	Cyber Security
7.	2132035	VELUGUBANTLA NANDINI	III B.Sc.(MPCS)	Cloud Security
8.	2132037	ANUSURI DEVI	III B.Sc.(MPCS)	Deep Learning
9.	2132040	DONGADA SINGARALAKSHMI	III B.Sc.(MPCS)	Block Chain Technology
10.	2132052	PANCHADA LAKSHMI KANTAM	III B.Sc.(MPCS)	Machine Learning

N.N.S. Eswari

Signature of the Lecturer

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DEPARTMENT OF COMPUTER SCIENCE

CREATIVE ASSIGNMENTS

on

BIG DATA

Submitted By

Ch.Vishnu Sri

III B.SC (M.P.CS.)

BIG DATA

Big data is a term that describes large, hard-to-manage volumes of data – both structured and unstructured – that inundate businesses on a day-to-day basis. But it's not just the type or amount of data that's important, it's what organizations do with the data that matters.

The importance of big data doesn't simply revolve around how much data you have. The value lies in how you use it. By taking data from any source and analyzing it, you can find answers that 1) streamline resource management, 2) improve operational efficiencies, 3) optimize product development, 4) drive new revenue and growth opportunities and 5) enable smart decision making. When you combine big data with high-performance analytics, you can accomplish business-related tasks such as:

- Determining root causes of failures, issues and defects in near-real time.
- Spotting anomalies faster and more accurately than the human eye.
- Improving patient outcomes by rapidly converting medical image data into insights.
- Recalculating entire risk portfolios in minutes.
- Sharpening deep learning models' ability to accurately classify and react to changing variables.
- Detecting fraudulent behavior before it affects your organization.

History of Big Data:

Big data refers to data that is so large, fast or complex that it's difficult or impossible to process using traditional methods. The act of accessing and storing large amounts of information for analytics has been around for a long time. But the concept of big data gained momentum in the early 2000s when industry analyst Doug Laney articulated the now-mainstream definition of big data as the three V's:

Volume. Organizations collect data from a variety of sources, including transactions, smart (IoT) devices, industrial equipment, videos, images, audio, social media and more. In the past, storing all that data would have been too costly – but cheaper storage using data lakes, Hadoop and the cloud have eased the burden.

Velocity. With the growth in the Internet of Things, data streams into businesses at an unprecedented speed and must be handled in a timely manner. RFID tags, sensors and smart meters are driving the need to deal with these torrents of data in near-real time.

Variety. Data comes in all types of formats – from structured, numeric data in traditional databases to unstructured text documents, emails, videos, audios, stock ticker data and financial transactions.

Big data primarily refers to data sets that are too large or complex to be dealt with by traditional data-processing application software. Data with many entries (rows) offer greater statistical power, while data with higher complexity (more attributes or columns) may lead to a higher false discovery rate. Though used sometimes loosely partly due to a lack of formal definition, the best interpretation is that it is a large body of information that cannot be comprehended when used in small amounts only.

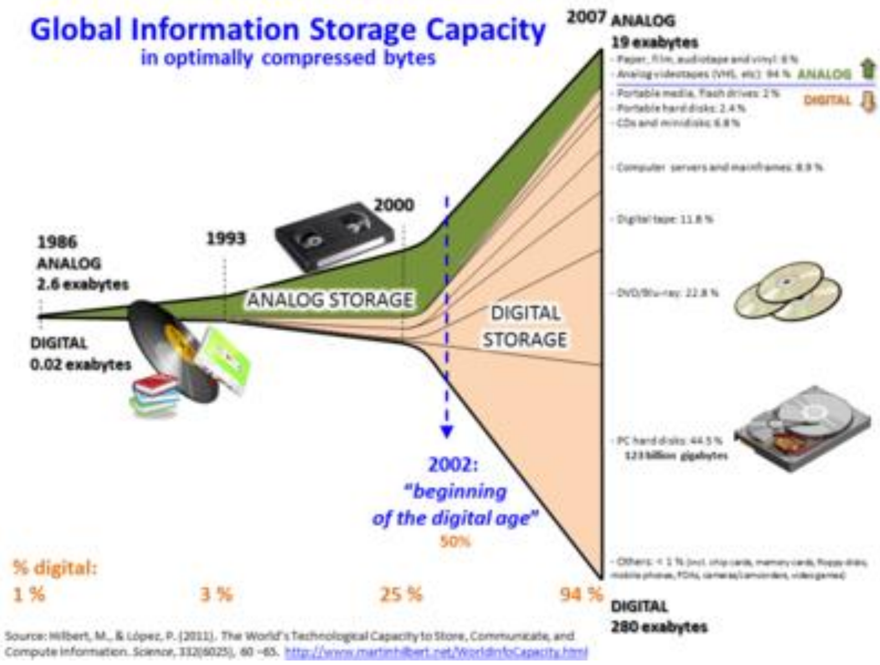
Big data analysis challenges include capturing data, data storage, data analysis, search, sharing, transfer, visualization, querying, updating, information privacy, and data source. Big data was originally associated with three key concepts: *volume*, *variety*, and *velocity*.The analysis of big data presents challenges in sampling, and thus previously allowing for only observations and sampling. Thus a fourth concept, *veracity,* refers to the quality or insightfulness of the data. Without sufficient investment in expertise for big data veracity, then the volume and variety of data can produce costs and risks that exceed an organization's capacity to create and capture *value* from big data.

Current usage of the term *big data* tends to refer to the use of predictive analytics, user behavior analytics, or certain other advanced data analytics methods that extract value from big data, and seldom to a particular size of data set. "There is little doubt that the quantities of data now available are indeed large, but that's not the most relevant characteristic of this new data ecosystem."Analysis of data sets can find new correlations to "spot business trends, prevent diseases, combat crime and so on". Scientists, business executives, medical practitioners, advertising and governments alike regularly meet difficulties with large data-sets in areas including Internet searches, fintech, healthcare analytics, geographic information systems, urban informatics, and business informatics. Scientists encounter limitations in e-Science work, including meteorology, genomics, connectomics, complex physics simulations, biology, and environmental research.

The size and number of available data sets have grown rapidly as data is collected by devices such as mobile devices, cheap and numerous information-sensing Internet of things devices, aerial (remote sensing), software logs, cameras, microphones, radio-frequency identification (RFID) readers and wireless sensor networks. The world's technological per-capita capacity to store information has roughly doubled every 40 months since the 1980s; as of 2012, every day 2.5 exabytes (2.5×2^{60} bytes) of data are generated. Based on an IDC report prediction, the global data volume was predicted to grow exponentially from 4.4 zettabytes to 44 zettabytes between 2013 and 2020. By 2025, IDC predicts there will be 163 zettabytes of data. According to IDC, global spending on big data and business analytics (BDA) solutions is estimated to reach $215.7 billion in 2021. While Statista report, the global big data market is forecasted to grow to $103 billion by 2027. In 2011 McKinsey & Company reported, if US healthcare were to use big data creatively and effectively to drive efficiency and quality, the sector could create more than $300 billion in value every year.] In the developed economies of Europe, government administrators could save more than €100 billion ($149 billion) in operational efficiency improvements alone by using big data. And users of services enabled by personal-location data could capture $600 billion in consumer surplus. One question for large enterprises is determining who should own big-data initiatives that affect the entire organization.

Relational database management systems and desktop statistical software packages used to visualize data often have difficulty processing and analyzing big data. The processing and analysis of big data may require "massively parallel software running on tens, hundreds, or even thousands of servers".What qualifies as "big data" varies depending on the capabilities of those analyzing it and their tools. Furthermore, expanding capabilities make big data a moving target. "For some organizations, facing hundreds of gigabytes of data for the first time may trigger a need to reconsider data management options. For others, it may take tens or hundreds of terabytes before data size becomes a significant consideration."

The term *big data* has been in use since the 1990s, with some giving credit to John Mashey for popularizing the term. Big data usually includes data sets with sizes beyond the ability of commonly used software tools to capture, curate, manage, and process data within a tolerable elapsed time. Big data philosophy encompasses unstructured, semi-structured and structured data; however, the main focus is on unstructured data. Big data "size" is a constantly moving target; as of 2012 ranging from a few dozen terabytes to many zettabytes of data.] Big data requires a set of techniques and technologies with new forms of integration to reveal insights from data-sets that are diverse, complex, and of a massive scale.



"Variety", "veracity", and various other "Vs" are added by some organizations to describe it, a revision challenged by some industry authorities.The Vs of big data were often referred to as the "three Vs", "four Vs", and "five Vs". They represented the qualities of big data in volume, variety, velocity, veracity, and value. Variability is often included as an additional quality of big data.

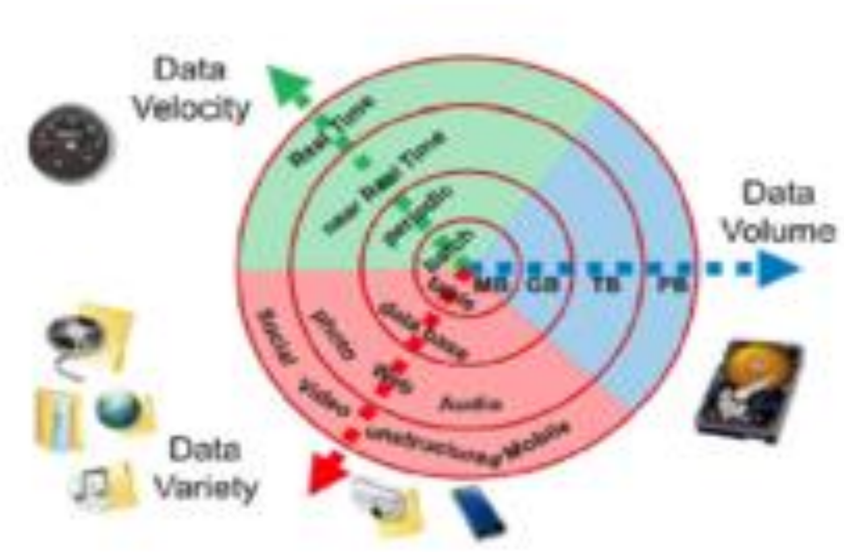
A 2018 definition states "Big data is where parallel computing tools are needed to handle data", and notes, "This represents a distinct and clearly defined change in the computer science used, via parallel programming theories, and losses of some of the guarantees and capabilities made by Codd's relational model."

In a comparative study of big datasets, Kitchin and McArdle found that none of the commonly considered characteristics of big data appear consistently across all of the analyzed cases. For this reason, other studies identified the redefinition of power dynamics in knowledge discovery as the defining trait.[1] Instead of focusing on the intrinsic characteristics of big data, this alternative perspective pushes forward a relational understanding of the object claiming that what matters is the way in which data is collected, stored, made available and analyzed.

Big data vs. business intelligence:

The growing maturity of the concept more starkly delineates the difference between "big data" and "business intelligence":[1]

- Business intelligence uses applied mathematics tools and descriptive statistics with data with high information density to measure things, detect trends, etc.
- Big data uses mathematical analysis, optimization, inductive statistics, and concepts from nonlinear system identification to infer laws (regressions, nonlinear relationships, and causal effects) from large sets of data with low information density to reveal relationships and dependencies, or to perform predictions of outcomes and behaviors.



Architecture:

Big data repositories have existed in many forms, often built by corporations with a special need. Commercial vendors historically offered parallel database management systems for big data beginning in the 1990s. For many years, WinterCorp published the largest database report.

Teradata Corporation in 1984 marketed the parallel processing DBC 1012 system. Teradata systems were the first to store and analyze 1 terabyte of data in 1992. Hard disk drives were

2.5 GB in 1991 so the definition of big data continuously evolves. Teradata installed the first petabyte class RDBMS based system in 2007. As of 2017, there are a few dozen petabyte class Teradata relational databases installed, the largest of which exceeds 50 PB. Systems up until 2008 were 100% structured relational data. Since then, Teradata has added unstructured data types including XML, JSON, and Avro.

In 2000, Seisint Inc. (now LexisNexis Risk Solutions) developed a C++-based distributed platform for data processing and querying known as the HPCC Systems platform. This system automatically partitions, distributes, stores and delivers structured, semi-structured, and unstructured data across multiple commodity servers. Users can write data processing pipelines and queries in a declarative dataflow programming language called ECL. Data analysts working in ECL are not required to define data schemas upfront and can rather focus on the particular problem at hand, reshaping data in the best possible manner as they develop the solution. In 2004, LexisNexis acquired Seisint Inc. and their high-speed parallel processing platform and successfully used this platform to integrate the data systems of Choicepoint Inc. when they acquired that company in 2008. In 2011, the HPCC systems platform was open-sourced under the Apache v2.0 License.

CERN and other physics experiments have collected big data sets for many decades, usually analyzed via high-throughput computing rather than the map-reduce architectures usually meant by the current "big data" movement.

In 2004, Google published a paper on a process called MapReduce that uses a similar architecture. The MapReduce concept provides a parallel processing model, and an associated implementation was released to process huge amounts of data. With MapReduce, queries are split and distributed across parallel nodes and processed in parallel (the "map" step). The results are then gathered and delivered (the "reduce" step). The framework was very successful, so others wanted to replicate the algorithm. Therefore, an implementation of the MapReduce framework was adopted by an Apache open-source project named "Hadoop". Apache Spark was developed in 2012 in response to limitations in the MapReduce paradigm, as it adds in-memory processing and the ability to set up many operations (not just map followed by reducing).

MIKE2.0 is an open approach to information management that acknowledges the need for revisions due to big data implications identified in an article titled "Big Data Solution Offering". The methodology addresses handling big data in terms of useful permutations of data sources, complexity in interrelationships, and difficulty in deleting (or modifying) individual records.

Studies in 2012 showed that a multiple-layer architecture was one option to address the issues that big data presents. A distributed parallel architecture distributes data across multiple servers; these parallel execution environments can dramatically improve data processing speeds. This type of architecture inserts data into a parallel DBMS, which implements the use of MapReduce and Hadoop frameworks. This type of framework looks to make the processing power transparent to the end-user by using a front-end application server.

The data lake allows an organization to shift its focus from centralized control to a shared model to respond to the changing dynamics of information management. This enables quick segregation of data into the data lake, thereby reducing the overhead time.

Technologies:

A 2011 McKinsey Global Institute report characterizes the main components and ecosystem of big data as follows:

- Techniques for analyzing data, such as A/B testing, machine learning, and natural language processing
- Big data technologies, like business intelligence, cloud computing, and databases
- Visualization, such as charts, graphs, and other displays of the data

Multidimensional big data can also be represented as OLAP data cubes or, mathematically, tensors. Array database systems have set out to provide storage and high-level query support on this data type. Additional technologies being applied to big data include efficient tensor-based computation, such as multilinear subspace learning,] massively parallel-processing (MPP) databases, search-based applications, data mining, distributed file systems, distributed cache (e.g., burst buffer and Memcached), distributed databases, cloud and HPC-based infrastructure (applications, storage and computing resources), and the Internet Although, many approaches and technologies have been developed, it still remains difficult to carry out machine learning with big data.

Some MPP relational databases have the ability to store and manage petabytes of data. Implicit is the ability to load, monitor, back up, and optimize the use of the large data tables in the RDBMS.

DARPA's Topological Data Analysis program seeks the fundamental structure of massive data sets and in 2008 the technology went public with the launch of a company called "Ayasdi".

The practitioners of big data analytics processes are generally hostile to slower shared storage,[60] preferring direct-attached storage (DAS) in its various forms from solid state drive (SSD) to high capacity SATA disk buried inside parallel processing nodes. The perception of shared storage architectures—storage area network (SAN) and network-attached storage (NAS)— is that they are relatively slow, complex, and expensive. These qualities are not consistent with big data analytics systems that thrive on system performance, commodity infrastructure, and low cost.

Real or near-real-time information delivery is one of the defining characteristics of big data analytics. Latency is therefore avoided whenever and wherever possible. Data in direct-attached memory or disk is good—data on memory or disk at the other end of an FC SAN connection is not. The cost of an SAN at the scale needed for analytics applications is much higher than other storage techniques.

Applications:

Big data has increased the demand of information management specialists so much so that Software AG, Oracle Corporation, IBM, Microsoft, SAP, EMC, HP, and Dell have spent more than $15 billion on software firms specializing in data management and analytics. In 2010, this industry was worth more than $100 billion and was growing at almost 10 percent a year, about twice as fast as the software business as a whole.

Developed economies increasingly use data-intensive technologies. There are 4.6 billion mobile-phone subscriptions worldwide, and between 1 billion and 2 billion people accessing the internet.Between 1990 and 2005, more than 1 billion people worldwide entered the middle class, which means more people became more literate, which in turn led to information growth.

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CREATIVE ASSIGNMENTS

on

ROBOTICS

Submitted By

P. DHANA JAYA

III B.SC (M.P.CS.)

ROBOTICS

Robotics is an interdisciplinary branch of electronics and communication, computer science and engineering. Robotics involves the design, construction, operation, and use of robots.

Robotics is the intersection of science, engineering and technology that produces machines, called robots that replicate or substitute for human actions.

While the overall world of robotics is expanding, a robot has some consistent characteristics:

1. Robots consist of some sort of mechanical construction. The mechanical aspect of a robot helps it complete tasks in the environment for which it's designed.
2. Robots need electrical components that control and power the machinery. Essentially, an electric current — a battery, for example — is needed to power a large majority of robots.
3. Robots contain at least some level of computer programming. Without a set of code telling it what to do, a robot would just be another piece of simple machinery. Inserting a program into a robot gives it the ability to know when and how to carry out a task.

Types of Robotics

Mechanical bots come in all shapes and sizes to efficiently carry out the task for which they are designed. All robots vary in design, functionality and degree of autonomy. From the 0.2

millimeter-long “RoboBee” to the 200 meter-long robotic shipping vessel “Vindskip,” robots are emerging to carry out tasks that humans simply can’t. There are five distinct types of robots that perform tasks depending on their capabilities. Below is an outline of these types and what they do.

Pre-Programmed Robots

Pre-programmed robots operate in a controlled environment where they do simple, monotonous tasks. An example of a pre-programmed robot would be a mechanical arm on an automotive assembly line. The arm serves one function — to weld a door on, to insert a certain part into the engine, etc. — and its job is to perform that task longer, faster and more efficiently than a human.

Humanoid Robots

Humanoid robots are robots that look like or mimic human behavior. These robots usually perform human-like activities (like running, jumping and carrying objects), and are sometimes designed to look like us, even having human faces and expressions. Two of the most prominent examples of humanoid robots are Hanson Robotics’ Sophia and Boston Dynamics’ Atlas.

Autonomous Robots

Autonomous robots operate independently of human operators. These robots are usually designed to carry out tasks in open environments that do not require human supervision. They are quite unique because they use sensors to perceive the world around them, and then employ decision-making structures (usually a computer) to take the optimal next step based on their data and mission. One example of an autonomous robot is the Roomba vacuum cleaner, which uses sensors to roam freely throughout a home.

Teleoperated Robots

Teleoperated robots are semi-autonomous bots that use a wireless network to enable human control from a safe distance. These robots usually work in extreme geographical conditions, weather and circumstances. Examples of teleoperated robots are the human-controlled submarines used to fix underwater pipe leaks during the BP oil spill or drones used to detect landmines on a battlefield.

Augmenting Robots

Augmenting robots, also known as VR robots, either enhance current human capabilities or replace the capabilities a human may have lost. The field of robotics for human augmentation is a field where science fiction could become reality very soon, with bots that have the ability to redefine the definition of humanity by making humans faster and stronger. Some examples of current augmenting robots are robotic prosthetic limbs or exoskeletons used to lift hefty weights.

How Do Robots Function?

Independent Robots

Independent robots are capable of functioning completely autonomously and independent of human operator control. These typically require more intense programming but allow robots to take the place of humans when undertaking dangerous, mundane or otherwise impossible tasks, from bomb diffusion and deep-sea travel to factory automation. Independent robots have proven to be the most disruptive to society, as they eliminate certain jobs but also present new possibilities for growth.

Dependent Robots

Dependent robots are non-autonomous robots that interact with humans to enhance and supplement their already existing actions. This is a relatively new form of technology and is being constantly expanded into new applications, but one form of dependent robots that has been realized is advanced prosthetics that are controlled by the human mind. A famous example of a dependent robot was created by Johns Hopkins APL in 2018 for Johnny Matheny, a patient whose arm was amputated above the elbow. Matheny was fitted with a modular prosthetic limb so researchers could study its use over a sustained period. The MPL is controlled via electromyography, or signals sent from his amputated limb that controls the prosthesis. Over time, Matheny became more efficient in controlling the MPL and the signals sent from his amputated limb became smaller and less variable, leading to more accuracy in its movements and allowing Matheny to perform tasks as delicate as playing the piano.

What Are the Main Components of a Robot?

Robots are built to present solutions to a variety of needs and fulfill several different purposes, and therefore, require a variety of specialized components to complete these tasks. However, there are several components that are central to every robot's construction, like a power source or a central processing unit. Generally speaking, robotics components fall into these five categories:

Control System

Computation includes all of the components that make up a robot's central processing unit, often referred to as its control system. Control systems are programmed to tell a robot how to utilize its specific components, similar in some ways to how the human brain sends signals throughout the body, in order to complete a specific task. These robotic tasks could comprise anything from minimally invasive surgery to assembly line packing.

Sensors

Sensors provide a robot with stimuli in the form of electrical signals that are processed by the controller and allow the robot to interact with the outside world. Common sensors found within robots include video cameras that function as eyes, photoresistors that react to light and microphones that operate like ears. These sensors allow the robot to capture its surroundings and process the most logical conclusion based on the current moment and allows the controller to relay commands to the additional components.

Actuators

A device can only be considered to be a robot if it has a movable frame or body. Actuators are the components that are responsible for this movement. These components are made up of motors that receive signals from the control system and move in tandem to carry out the movement necessary to complete the assigned task. Actuators can be made of a variety of materials, such as metal or elastic, and are commonly operated by use of compressed air (pneumatic actuators) or oil (hydraulic actuators) but come in a variety of formats to best fulfill their specialized roles.

Power Supply

Like the human body requires food in order to function, robots require power. Stationary robots, such as those found in a factory, may run on AC power through a wall outlet but more commonly, robots operate via an internal battery. Most robots utilize lead-acid batteries for their safe qualities and long shelf life while others may utilize the more compact but also more expensive silver-cadmium variety. Safety, weight, replaceability and lifecycle are all important factors to consider when designing a robot's power supply. Some potential power sources for future robotic development also include pneumatic power from compressed gasses, solar power, hydraulic power, flywheel energy storage organic garbage through anaerobic digestion and nuclear power.

End Effectors

End effectors are the physical, typically external components that allow robots to finish carrying out their tasks. Robots in factories often have interchangeable tools like paint sprayers and drills, surgical robots may be equipped with scalpels and other kinds of robots can be built with gripping claws or even hands for tasks like deliveries, packing, bomb diffusion and much more.

EXAMPLE OF ROBOTICS

Uses of Robots

Robots have a wide variety of use cases that make them the ideal technology for the future. Soon, we will see robots almost everywhere. We'll see them in hospitals, hotels and even on roads.

APPLICATIONS OF ROBOTICS

Conservation: fighting forest fires.
Manufacturing: working in factories, finding and carrying items in warehouses.
Companionship: providing company to elderly individuals.
Healthcare: assisting in surgical procedures.
Delivery: completing food delivery and last-mile fulfillment.
Household: vacuuming and mowing the grass.
Rescue: undertaking search-and-rescue missions after natural disasters.
Military Operations: detecting landmines in war zones.

Robotics in Manufacturing

The manufacturing industry is probably the oldest and most well-known user of robots. These robots and co-bots (bots that work alongside humans) work to efficiently test and assemble products, like cars and industrial equipment. It’s estimated that there are more than three million industrial robots in use right now.

Logistics Robots

Shipping, handling and quality control robots are becoming a must-have for most retailers and logistics companies. Because we now expect our packages to arrive at blazing speeds, logistics companies employ robots in warehouses, and even on the road, to help maximize time efficiency. Right now, there are robots taking your items off the shelves, transporting them across the warehouse floor and packaging them. Additionally, a rise in last-mile robots (robots that will autonomously deliver your package to your door) ensure that you’ll have a face-to-metal-face encounter with a logistics bot in the near future.

Robots for Home

It’s not science fiction anymore. Robots can be seen all over our homes, helping with chores, reminding us of our schedules and even entertaining our kids. The most well-known example of home robots is the autonomous vacuum cleaner Roomba. Additionally, robots have now evolved to do everything from autonomously mowing grass to cleaning pools.

Travel Robots

Is there anything more science fiction-like than autonomous vehicles? These self-driving cars are no longer just imagination. A combination of data science and robotics, self-driving vehicles are taking the world by storm. Companies like Tesla, Ford, Waymo, Volkswagen and BMW are all working on the next wave of travel that will let us sit back, relax and enjoy the ride. Rideshare companies Uber and Lyft are also developing autonomous rideshare vehicles that don’t require humans to operate the vehicle.

Healthcare Robotics

Robots have made enormous strides in the healthcare industry. These mechanical marvels have use in just about every aspect of healthcare, from robot-assisted surgeries to bots that help humans recover from injury in physical therapy. Examples of robots at work in healthcare are Toyota’s healthcare assistants, which help people regain the ability to walk, and TUG, a robot designed to autonomously stroll throughout a hospital and deliver everything from medicines to clean linens.