

INTRODUCTION TO ICT

CS202 LECTURE # 2

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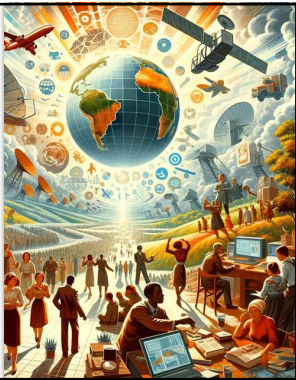


Introduction to ICT

- **Information:** Referred as processed form of data which can be recorded, organized and transmitted.
- **Communication:** Transfer of ideas (data & information) through systems, devices such as computer, cell phones, internet, TV etc.
- **Technology:** The way one make, modify and use tools, techniques, systems and machines to solve problems efficiently.

Definition of ICT

- A Broad Range of **Technologies, Systems, and Applications**
- Creation, Storage, Retrieval, Transmission, Manipulation of **Information**
- Convergence of **Computing, Telecommunications, and Information Systems**
- Facilitate Communication and Efficient **Information Handling**



Evolution of ICT

- Development of Large **Mainframe Computers** – Mid 20th Century
- Advent of Microprocessors and **Personal Computers** – 1970s
- Birth of the Internet and **World Wide Web** – 1990s
- Development of Laptops, **Smartphones**, and Tablets
- Rise of **Cloud Computing**
- Emergence of New Technologies
 - **Artificial Intelligence** / Machine Learning
 - **Internet of Things** (IoT)
 - **Blockchain**

Significance of ICT

- **Communication:** Enabling People to Connect and Interact
 - Email, Messaging, Video Conferencing, Social Media
- **Democratization of Information:** Facilitating Access to Knowledge
 - Search Engines, Online Databases, Digital Libraries
- **Impact on Businesses:**
 - Remote Work, Flexible Schedules, Global Collaborations
 - Streamline Operations, Enhance Productivity, Economic Growth, Worldwide Customers, 24/7 Operation

Applications of ICT

1. Education:

▪ Access to Education:

- Online Learning Platforms, Digital Educational Resources, Virtual Classrooms
- Learn Anytime and Anywhere

▪ Personalized Learning

▪ Interactive Content

▪ Collaborative Tools



Applications of ICT

2. Healthcare:

- Improving Patient Care
- Facilitating Medical Research
- Transforming Healthcare Delivery
- **Electronic Health Records (EHRs):** Digitized Patient Information
- **Telemedicine:** Remote Consultation
- **Medical Imaging Technologies, Data Analytics, and AI**
 - Assist in Diagnosis, Treatment Planning, and Predicting Health Outcomes



Applications of ICT

3. Business:

- Streamline Operations
- Improve Efficiency
- Expand Reach
- **E-Commerce:**
 - Revolutionized Retail
 - Reach Global Market
 - Operate 24/7
- **Supply Chain Management:** Optimize Logistics, Inventory, Distribution
- **Customer Relationship Management (CRM):** Enhance Customer Service, Marketing Strategies



Applications of ICT

4. Communication and Media:

- **New Channels** for Information Dissemination, Content Creation, and Audience Engagement
 - Social Media Platforms
 - Online Publishing
- **Digital Media Streaming Platforms**
 - Revolutionized Way of Entertainment's Consumption
 - On-Demand to Access to Movies, Music, and TV Shows



Applications of ICT

5. Government and Governance:

▪ E-Governance

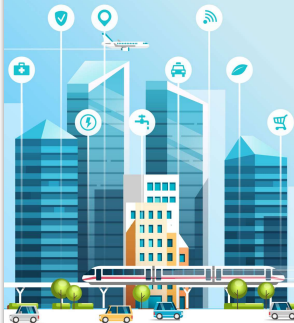
- Digitize Administrative Processes
- Enable Online Service Delivery
- Reduce Bureaucracy

▪ Digital Citizen Engagement Platforms

- Facilitate Public Participation in Decision-Making Processes

▪ Data Analytics and ML

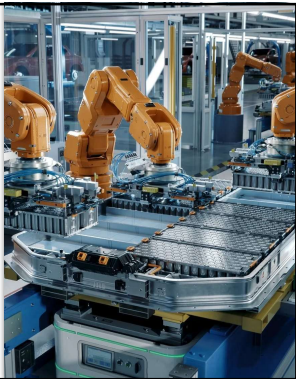
- Assist in Analyzing Large Datasets
- Inform Evidence-Based Policies
- Enhance Public Services



Applications of ICT

6. Manufacturing and Industry:

- **Industrial Internet of Things (IIoT)**
 - Connect Machines, Sensors, and Systems
 - Enable Real-Time Data Collection, Analysis, and Process Optimization
- **Robotics and Automation**
 - Enhance Productivity and Quality Control in Manufacturing Processes
- **AR/VR**
 - Assist in Product Design, Training, and Simulation



Applications of ICT

7. Transportation and Logistics:

▪ Intelligent Transportation Systems

- Monitor and Manage Traffic Flow
- Reduce Congestion
- Enhance Road Safety

▪ Fleet Management Systems

- Enable Real-Time Tracking of Vehicles
- Optimize Routes and Fuel Efficiency

▪ E-Commerce and Logistic Platforms

- Streamline Delivery Processes
- Enable Real-Time Tracking and Efficient Supply Chain Management



Applications of ICT

8. Agriculture:

- Smart Farming
- **Crop Monitoring, Soil Analysis, and Precision Agriculture** Using Drones, Satellite Imaging, and Sensor Networks
- Optimize **Resource Usage** and Improve **Crop Yield**
- Real-Time **Weather Information, Market Data, and Expert Advice**
- Informed Decision-Making and Improved Farming Practices



What is Computing ?

Computing is one of the main technologies of ICT.

It's the process of utilizing computer systems and technology to perform tasks that involve data processing, storage, and communication.

It encompasses a wide range of activities including designing, building, and programming computers and other hardware, as well as the algorithms and software that run on them.

History

1830s

1

Charles Babbage designs the Analytical Engine, an early mechanical computer concept.

3

1940s

Development of the first electronic computers, such as ENIAC, during World War II.

5

1960s

The creation of ARPANET, the precursor to the modern internet, marks the beginning of networked communication.

2

Ada Lovelace writes the first algorithm intended for implementation on a machine, becoming the world's first computer programmer.

1840s

4

The invention of the transistor revolutionizes electronics, leading to smaller and more powerful computers.

1950s

History

1960s

5 The creation of ARPANET, the precursor to the modern internet, marks the beginning of networked communication.

1980s

7 The rise of graphical user interfaces (GUIs) and software applications, such as Microsoft Windows and Macintosh OS, simplifies computer use.

6 Introduction of the personal computer (PC) by companies like Apple and IBM, making computing accessible to individuals and small businesses.

1970s

8 The World Wide Web (WWW) is developed by Tim Berners-Lee, leading to the explosion of internet use and global connectivity.

1990s

History

2000s

9

Mobile technology advances rapidly with the development of smartphones, integrating communication, computing, and multimedia in a single device.

2020s

10

Continued advancement in artificial intelligence (AI), machine learning, and the Internet of Things (IoT) expands ICT's role in everyday life and industry.

The rise of cloud computing, social media, and big data analytics transforms how information is stored, shared, and analyzed.

9

2010s

An abstract digital landscape with glowing cubes and binary code. The scene is rendered in shades of teal and blue, with bright green and yellow light sources emanating from the cubes. Binary code (0s and 1s) is visible in the background, suggesting a digital environment.

Key Concepts in Computing

- **Computing:** Encompasses both hardware (physical devices) and software (programs and applications).
- **Hardware:** CPUs, memory, storage devices, and input/output peripherals that form the physical components of computers.
- **Software:** Operating systems, applications, and utilities that run on hardware to perform specific tasks.
- **Firmware:** Specialized software that is embedded in hardware devices to control their functions.

Computing in Real Life

- **Embedded Systems:** Microcontrollers in devices like smartphones, cars, and home appliances.
- **High-Performance Computing (HPC):** Supercomputers used in scientific research, weather forecasting, and financial modeling.
- **Virtualization and Cloud Computing:** Technologies that allow multiple virtual machines to run on a single physical server, enabling scalable and flexible IT infrastructure.

Microcontrollers

- A **small computer** on a single integrated circuit (IC) that contains a processor, memory, and input/output peripherals
- Designed to control and **interact with external devices**, such as sensors, actuators, and other microcontrollers

Embedded Systems

- A **larger** system that incorporates a microcontroller (or other processing unit) as a key component
- Designed to perform a **specific function** or set of functions, and they often include additional components, such as:
 - **Sensors:** To detect and measure physical parameters, such as temperature, pressure, or motion
 - **Actuators:** To control external devices, such as motors, valves, or displays
 - **Power Management:** To manage power consumption and ensure reliable operation
 - **Communication Interfaces:** To exchange data with other systems or devices

Relationship between Microcontrollers and Embedded Systems

- **Microcontrollers** are a fundamental building block of embedded systems. A microcontroller is often the "brain" of an embedded system, providing the processing power and control logic needed to perform specific tasks.
- An **embedded system** typically includes additional components beyond just the microcontroller, such as sensors, actuators, and power management circuitry.

Relationship between Microcontrollers and Embedded Systems

▪ Examples:

- **A smart thermostat:** The microcontroller is the component that processes temperature data and controls the heating/cooling system. Embedded system includes additional components, such as temperature sensors, a display, and communication interfaces.
- **A robot:** The microcontroller controls the robot's movements and interactions. Embedded system includes sensors (e.g., cameras, ultrasonic sensors), actuators (e.g., motors), and power management circuitry.

Relationship between Microcontrollers and Embedded Systems

- Summary

- Microcontrollers are a crucial component of embedded systems, but they are **not the same** thing.
- **Microcontrollers** provide the processing power and control logic, while **embedded systems** encompass a broader range of components and functionality.

Communication Technology

- **Data Communication:** The transfer of data between devices using transmission media. Methods like packet switching and circuit switching, which determine how data is sent and received.
- **Internet Technologies:** Protocols and systems enabling global data exchange and connectivity.
- **Networking:** Connecting computers and devices through local (LAN) or wide-area networks (WAN), using technologies like Ethernet and Wi-Fi.

Communication Technology in Real Life

- **Internet of Things (IoT):** Devices that communicate over the internet, from smart thermostats to industrial sensors.
- **5G Networks:** The next generation of mobile networks, enabling faster data transmission and supporting emerging technologies like autonomous vehicles.
- **Cybersecurity:** Protecting communication networks and data from unauthorized access, crucial for maintaining the integrity and privacy of IT systems.

Programming Languages

- **C/C++:** Essential for system programming and developing high-performance applications.
- **Python:** Popular for scripting, automation, and data analysis in IT.
- **JavaScript and SQL:** Key for web development and database management, vital components of modern IT systems.

More Programming Languages

- **HTML/CSS:** For designing and structuring web pages, a fundamental skill in web-based IT.
- **Bash/Shell Scripting:** Automating tasks in Unix/Linux environments, commonly used in IT administration.
- **PowerShell:** A task automation and configuration management framework from Microsoft, essential for Windows IT environments.

Career Paths



Software Engineer: Designing and developing software systems and applications.



Network Engineer: Building and maintaining communication networks, ensuring reliable data transmission.



Cybersecurity Analyst: Protecting IT systems from threats, ensuring data integrity and confidentiality.

More Career Paths



Cloud Solutions Architect: Designing and implementing cloud computing solutions.



DevOps Engineer: Bridging development and operations to streamline software delivery and infrastructure management.

Getting Started



Online Resources: Platforms like Coursera, edX, and Udemy offer courses in computing and communication technologies.



Hands-On Practice: Build projects, participate in coding challenges, and experiment with hardware and software.



Community Engagement: Join tech meetups, forums, and hackathons to connect with peers and mentors.

More Getting Started



Reading and Research: Stay updated with industry trends through blogs, research papers, and technical books.



Certifications: Obtain certifications in networking (e.g., Cisco CCNA), security (e.g., CompTIA Security+), and more.

Reading Assignment

Book: Understanding Computers: Today and Tomorrow. Comprehensive by Deborah Morley, Charles S. Parker (16th Edition), Cengage Learning, 2017

Read:

- Chapter 1 Introduction to the World of Technology – 4
 - What Is a Computer and What Does It Do? 10
 - Data vs. Information 11
 - Computers Then and Now 12
 - Hardware 14
 - Software 16
 - Computer Users and Professionals 17

Thank You !

