Emerging Technologies Lecture 4 Notes

Posted in **9 Computer Science**

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Definition of IoT

IoT is a network of physical objects (“things”) that are connected to the internet. These devices have sensors and software that allow them to collect and exchange data with other devices and systems.

Examples of IoT:[Any 2 Examples]

- A smartwatch that tracks your heart rate and sends data to your phone in real time
- A smart fridge that tells you when food is running low
- Smart lights that can be turned on or off using a mobile phone
- Smart AC that adjusts temperature automatically
- Security cameras that send live video to your phone
- Weather apps that use data from internet-connected sensors to show real-time weather updates

Significance of IoT

IoT is important because it connects real-world devices to the internet so they can collect and share information. This helps us save time, work faster, and make better decisions.

Examples:[Any 2 Examples]

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- Weather apps that use data from internet-connected sensors to show real-time weather updates
- Smart irrigation systems that water crops automatically based on soil moisture
- Smart traffic lights that adjust timing to reduce traffic jams

Components of an IoT System

An IoT system typically consists of five main components:

1. Sensors

Sensors collect information from the environment such as temperature, humidity, motion, or light levels. They are the “eyes and ears” of IoT systems.

Example: A temperature sensor in an air-conditioner adjusts cooling based on room temperature.

2. Actuators

Actuators take action based on received data, converting energy into motion or triggering devices.

Example: A motor that opens windows automatically when the room becomes too hot.

3. Devices

Devices are everyday objects connected to the internet to perform tasks based on sensor data.

Example: Smart refrigerators that alert users when items are running low.

4. Networks

Networks are communication pathways that connect devices and sensors to the internet, allowing them to share data. These networks can be wired or wireless.

Examples of Networks:

- Wi-Fi connecting phones, laptops, and smart home devices
- Bluetooth connecting earbuds, smartwatches, and phones
- 4G/5G mobile networks used for internet on smartphones

5. Data Analysis

Data analysis involves processing and studying collected data to make intelligent decisions.

Example: A fitness app analyzing steps data from a smartwatch to suggest daily goals.

IoT Applications

Healthcare

IoT devices in healthcare help monitor patient health, send alerts, and improve treatment outcomes.

- Wearable devices track heart rate, blood sugar levels, and sleep patterns.
- Smart pill bottles remind patients to take their medicine on time.
- Emergency alert systems send real-time notifications to doctors and hospitals.

Transportation

IoT improves traffic management, increases safety, and makes transportation systems more efficient.

- Smart traffic lights adjust based on traffic to reduce jams
- Connected cars give alerts and show navigation on the screen

- GPS tracking helps find buses, taxis, or delivery trucks in real time
- Ride apps like Uber use IoT to show nearby drivers and location

Smart Homes

IoT enables home automation for comfort, safety, and energy saving.

- Smart lights and thermostats adjust automatically based on room usage
- Security cameras and smart locks allow remote monitoring and control
- Smart speakers (like Alexa) control home devices using voice commands

Agriculture

IoT helps farming by monitoring soil, crops, and weather in real time to improve productivity.

- Soil sensors check moisture and send alerts when watering is needed
- Automatic irrigation systems water crops based on soil conditions
- Drones monitor crop health and help estimate total crop production
- Weather apps help farmers plan irrigation and harvesting

Security and Privacy in IoT

While IoT improves efficiency and convenience, it also introduces security and privacy risks:

- Devices can be hacked to steal sensitive information.
- Data transmitted over networks may be intercepted.
- Privacy breaches can occur if personal data is mishandled.

1. Strong Passwords

Use strong and unique passwords for each IoT device to prevent unauthorized access and improve security.

How to make a strong password: Use a mix of uppercase and lowercase letters, numbers, and special characters, and avoid using common words or simple patterns.

2. Regular Updates

Keep device software and firmware updated to patch security vulnerabilities.

Example: Updating your smart TV to the latest software version helps fix security issues and protects it from being exploited by hackers.

3. Encryption

Encryption protects data by converting it into a secure format so that only authorized users can read it.

Example: Heart rate data sent from a smartwatch to a doctor is encrypted to keep the patient's information private and secure.