

## UNIT I – Sensors for IoT

Active and Passive Sensors, Different Types of Sensors such as Capacitive, Resistive, and Surface Acoustic Wave Sensors for Pressure, Humidity, Toxic Gas; Sensors for Water (pH) quality, Accelerometer, Gyroscope, Moisture, Hall effect and Humidity

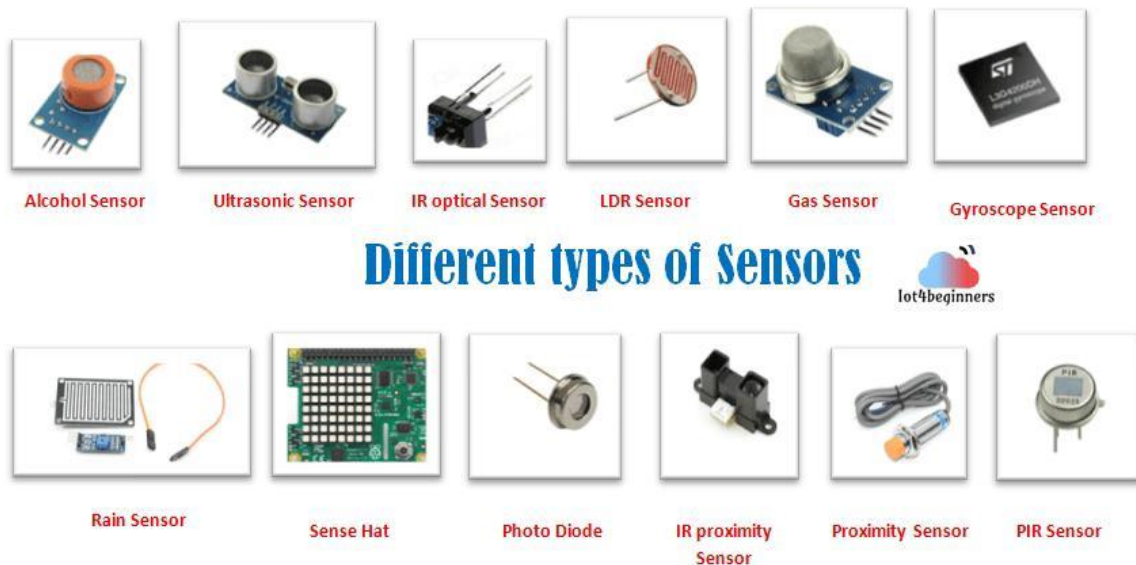
IoT sensors are hardware devices that collect data from the physical world (like temperature, motion, light) and transmit it over the internet for analysis, forming the backbone of connected systems by enabling smart actions and automation; common types include temperature, proximity, motion, pressure, humidity, light, and gas sensors, categorized by what they measure (physical/chemical), signal type (analog/digital), or interaction (contact/non-contact).

### What are IoT Sensors?

- **Definition:** Sensors are the "eyes and ears" of the Internet of Things (IoT), physical devices embedded in objects that detect and measure changes in their environment.
- **Function:** They convert physical phenomena (like heat, movement, or light) into digital data, which is then sent to a central system or the cloud for processing, enabling devices to understand their surroundings and act intelligently.

### Common Types of IoT Sensors

These are often classified by the physical quantity they detect:



- **Temperature Sensors:** Measure heat, vital for HVAC, cold chain, and industrial processes.
- **Proximity Sensors:** Detect the presence or distance of objects without physical contact, used in parking, smartphones.
- **Motion Sensors:** Detect movement, crucial for security systems, smart lighting.
- **Humidity Sensors:** Measure moisture in the air, important for agriculture, weather, and comfort.
- **Pressure Sensors:** Monitor gas or liquid pressure, used in automotive, weather forecasting, and industrial monitoring.
- **Light Sensors (Photoresistors/LDRs):** Measure light intensity, enabling automatic adjustments in smart lighting and cameras.
- **Gas Sensors:** Detect specific gases, used for air quality monitoring and safety.
- **Image/Optical Sensors:** Capture visual data, converting light into digital images.

- **Accelerometer & Gyroscope:** Detect motion, orientation, and vibration, used in fitness trackers, vehicles.

### Classification by Signal & Interaction

- **Analog vs. Digital:** Analog sensors produce continuous signals, while digital sensors output discrete binary signals.
- **Contact vs. Non-Contact:** Contact sensors require touching the object, while non-contact sensors (like infrared or proximity) measure from a distance.
- **Active vs. Passive:** Active sensors generate their own signal (e.g., radar), while passive sensors only detect energy (e.g., passive infrared).

### Role in IoT Systems

- **Data Collection:** Gather real-time data from the physical world.
- **Automation:** Allow devices to respond to environmental changes automatically (e.g., a light turning on when motion is detected).
- **Insights:** Provide data for analysis, leading to better decision-making and efficiency in applications from smart homes to industrial automation.

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