NETAJI SUBHAS UNIVERSITY JAMSHEDPUR

Subject Name:-   IoT
Topic Name:-   IoT in Agriculture
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What is IoT?

- The Internet of Things (IoT) refers to the network of interconnected physical devices, vehicles, buildings, and other objects embedded with sensors, software, and network connectivity, allowing them to collect and exchange data.

- In simple terms, IoT enables devices to communicate and share information with each other through the internet.

- IOT means accessing and controlling daily usable devices and equipment's using the Internet. The term "Things" in the Internet of Things refers to anything and everything in day-to-day life which is accessed or connected through the internet.

- IOT is an advanced automation and analytics system that deals with artificial intelligence, sensor, networking, electronic, cloud messaging, etc., to deliver complete systems for the product or services.

THE KEY COMPONENTS OF IOT

- **Devices/Things:** These are the physical objects or devices that are equipped with sensors, actuators, and connectivity to interact with the environment and other devices. Examples include smart thermostats, wearable devices, industrial machinery, and more.

- **Sensors and Actuators:** Sensors are responsible for collecting data from the physical environment, such as temperature, humidity, light, and more. Actuators, on the other hand, enable devices to perform actions based on the data received. For example, a smart thermostat might use a temperature sensor to collect data and an actuator to adjust the temperature.
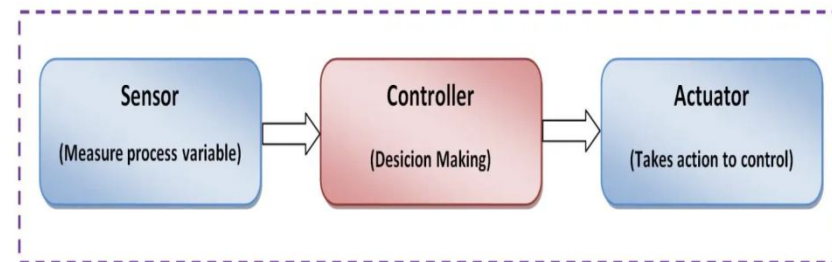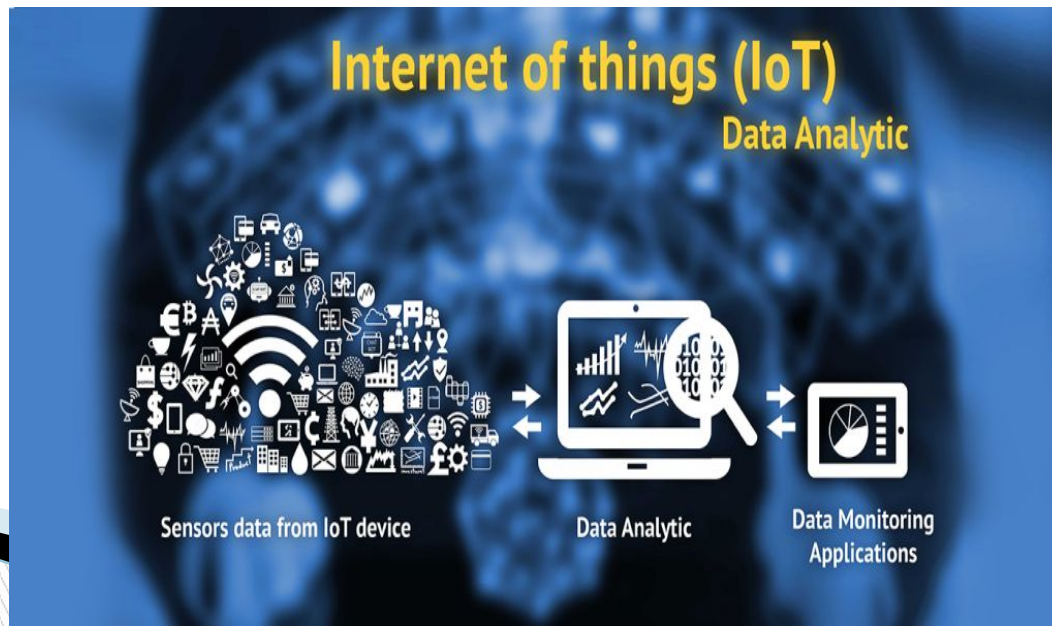

Sensor (Measure process variable)	Controller (Desicion Making)	Actuator (Takes action to control)

Figure- Sensor and actuator in a system

- **Connectivity:** Devices in an IoT system need a means of communication to share data with each other. This is typically achieved through wireless technologies such as Wi-Fi, Bluetooth, Zigbee, or cellular networks.

- **Data Processing and Analytics:** The data collected by IoT devices is often sent to cloud servers or edge devices for processing and analysis. This allows for insights to be gained, patterns to be identified, and intelligent decisions to be made based on the data.

- **User Interface**: IoT applications often have user interfaces that allow users to monitor and control connected devices. This can be through mobile apps, web interfaces, or other means.
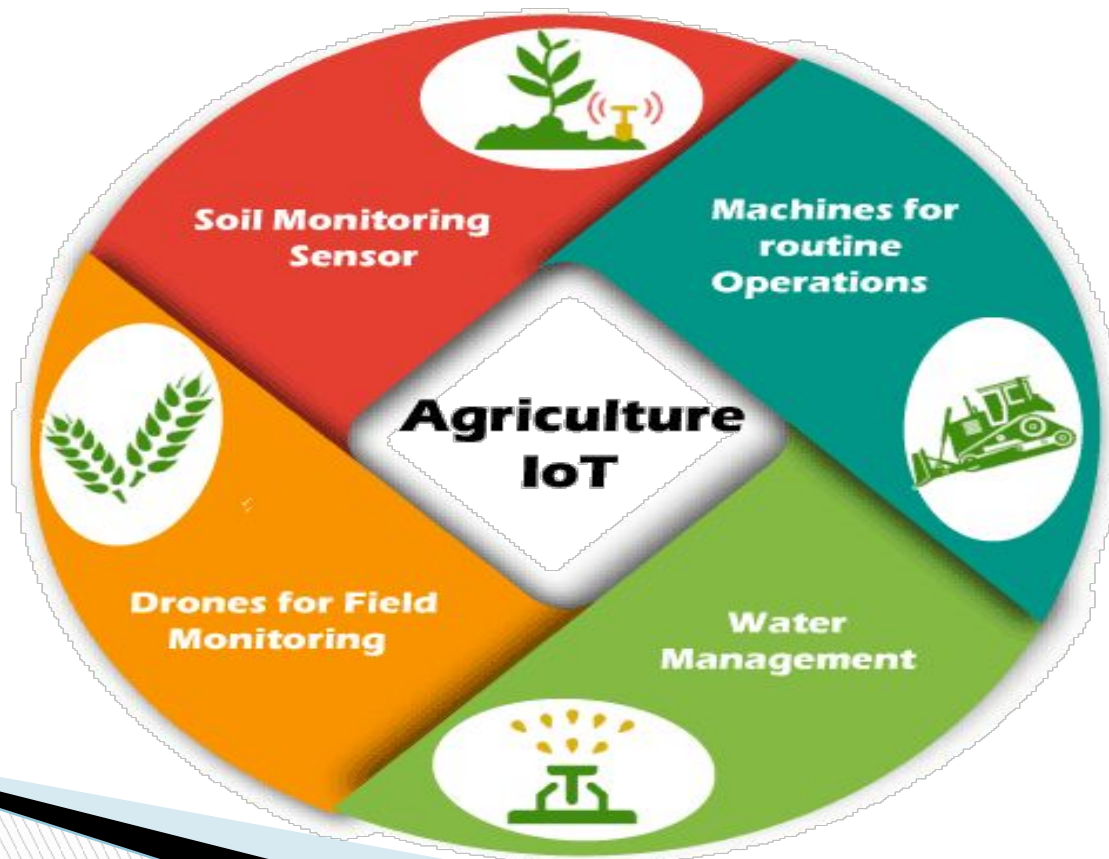

- **Security**: Given the sensitive nature of the data involved, security is a crucial aspect of IoT. Measures such as encryption, authentication, and secure protocols are implemented to protect data and ensure the integrity of the IoT ecosystem.
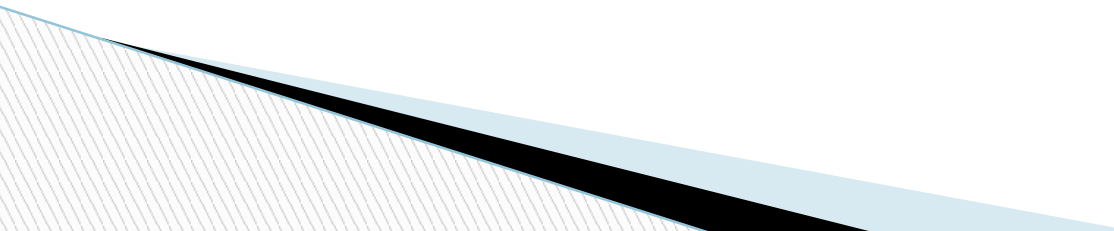
IOT IN AGRICULTURE

❑ IoT in agriculture, often referred to as Smart Agriculture or Precision Agriculture, involves the integration of technology to monitor and manage farming practices more efficiently.
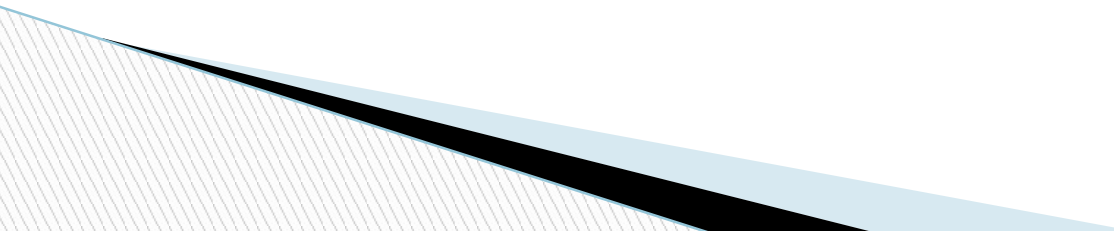
IOT IN AGRICULTURE

- By the year 2050, the world's growing population is estimated to have reached about 10 billion.
- To feed such a large population, agriculture needs to marry technology and get the best results.
- Agriculture is another important domain for IOT.
- IOT systems play an important role for crop and soil monitoring and give a proper solution accordingly.
- IOT leads to smart farming.
- Using IOT, farmers can minimize waste and increase productivity.
- The system allows the monitoring of fields with the help of sensors.
- Farmers can monitor the status of the area.

Challenges in the modern agriculture industry

The challenges faced by the farming industry and agriculture are listed as follows -

- Lack of workforce and manpower

- Environmental challenges and global warming

- Requirement of large manual intervention

- Lack of proper monitoring

- Challenges in analyzing the large scale unstructured data

VARIOUS USES OF IOT IN AGRICULTURE

IOT analytics in agriculture

The data from smart sensors can be further analyzed for automated decision-making and predictive analysis. Machine learning and predictive analysis will be helpful for farmers to cope up with the weather conditions such as drought, flood, etc.

Drone-based uses

Drones are also useful in smart farming. On one side, drones are useful to monitor the soil, air, moisture quality, and on another side, they can also be used for physical activities such as prevention of physical breakouts in farms, automated spraying of fertilizers, and many more. Although there are some limitations of using a drone, but it is useful to reduce the manual workforce.

Real-time crop monitoring

- Motion detectors, light detectors, smart-motion sensing sensors, smart sensors are useful to provide real-time data to farmers of their farms. It will be helpful in the monitoring of the quality of their products.

Smart Irrigation system

□ It is one of the parts of smart agriculture using IOT. In it, IOT checks the water lanes created by the farmer or the moisture level in the environment.

Livestock management

- Livestock requires regular monitoring. Smart tracking using IOT can be helpful to farmers to get the information of stock directly on their smart devices. It will be helpful to detect flu breakouts much earlier, which results in the separation of non-infected breeds with infected ones.

Tank level monitoring

☐ IOT helps to remotely monitor the level of the water tank and configure the alerts when the specific level has been reached.

Smart greenhouse solutions

- Usually, the greenhouses are used for maintaining the required atmosphere for plants. This process demands manual intervention and continuous monitoring. But a smart greenhouse designed using IOT monitors and controls the climate intelligently and also reduces the requirement of manual intervention. Adoption of IOT in the greenhouse is cost-effective and increases accuracy as it eliminates human intervention. As an instance, solar power IOT sensors build inexpensive and modern greenhouses.
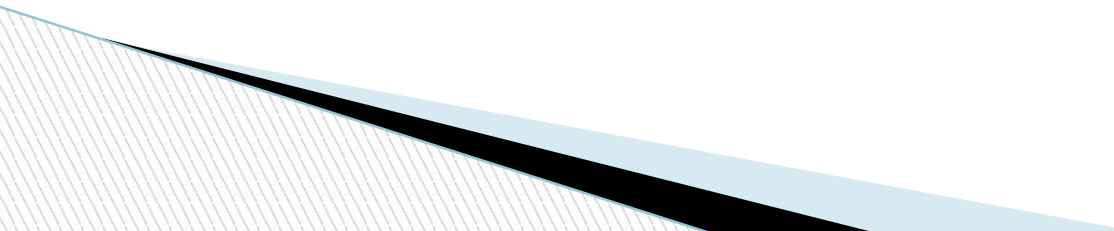
Data analytics

- End-to-end IOT platform and cloud-based data storage play a vital role in smart agriculture systems. In IOT, sensors are the primary source of collecting the data on a large scale. Using the analytics tools, the data is analyzed and transformed into meaningful information. Data analytics helps in the analysis of crop conditions, weather conditions, and livestock conditions. In Agriculture, IOT helped the farmers in maintaining the quality of crops.
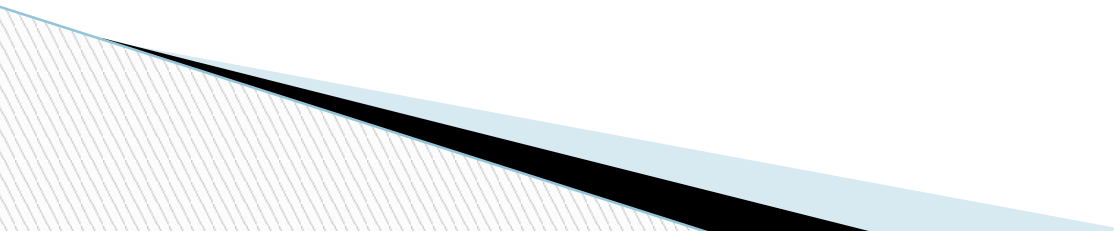
Infrastructure requirements

There are some infrastructure requirements for adopting smart farming in IOT. Some of the requirements are listed as follows -

- Hardware maintenance cost
- Continuous connectivity to the internet
- Required high investments in drones, sensors
- The requirement to hire highly trained staff for management and to operate
- Requirement of power connectivity to operate and charge the robots and drones

Conclusions

- In this presentation, we have discussed the applications and infrastructure requirements of using IOT in agriculture. People always required eating and drinking. For this, the development of the agriculture sector is always a priority. Use of IOT in agriculture has a big promising future. IOT is a driving force to increase agricultural production in a cost-effective manner. Smart farming through IOT technologies helps the farmer in increasing the productivity and reduces the waste generation.