

# INTEGRATING SATELLITE DATA INTO APPLICATIONS

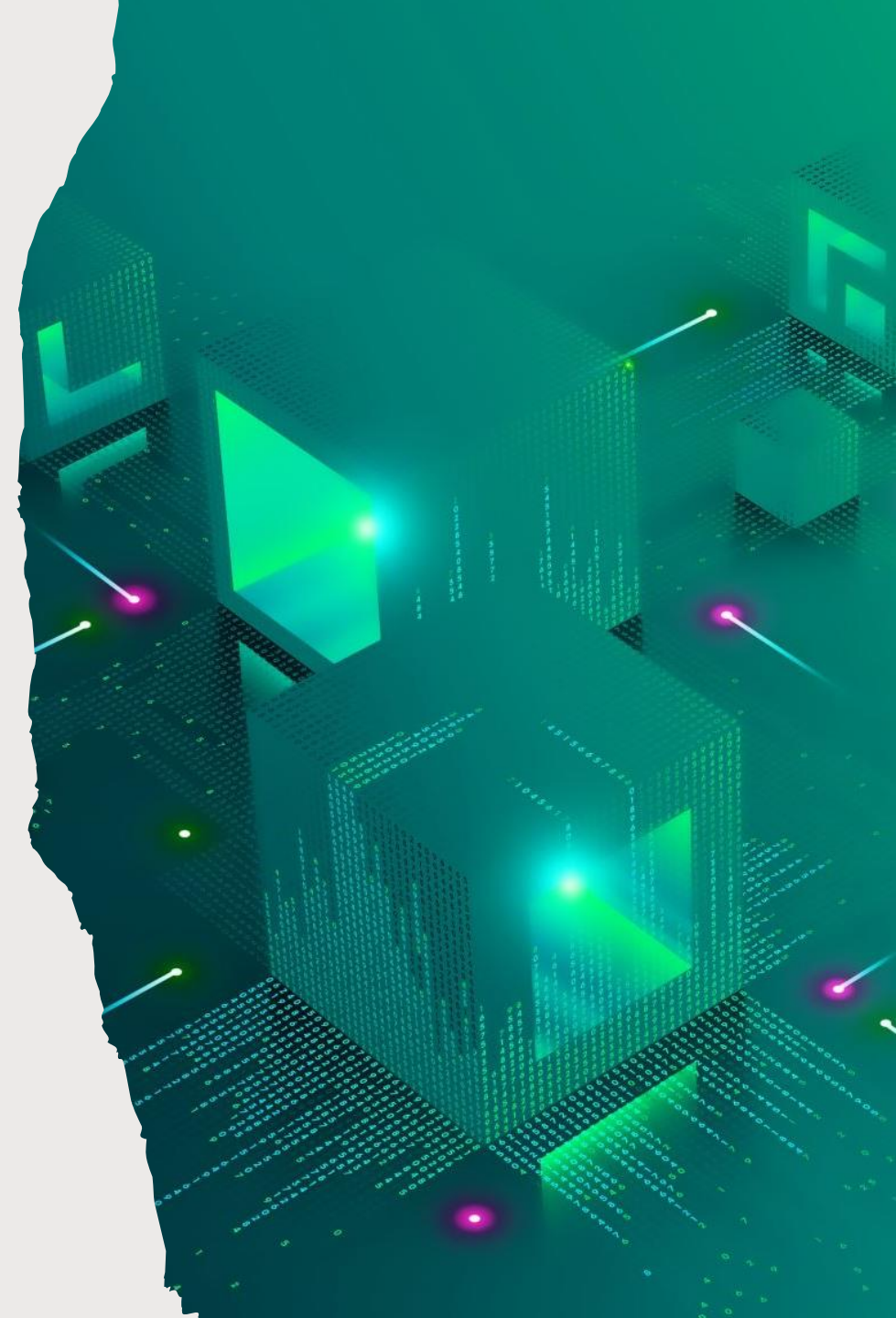


By Omar Al-saga

Senior Software Developer

“Effective disaster response starts before the event occurs – in the planning, preparation and prevention phases...this is where remote sensing and geospatial technologies are increasingly being applied,”

SAID AMANDA O’CONNOR, AT L3HARRIS GEOSPATIAL



## SMALLER SATELLITES

The miniaturization of propulsion, stabilization and power subsystems has reduced the size of satellites to the point where entire constellations can be built and launched for less than the cost of a single legacy platform like Landsat and SPOT. Multi-satellite constellations have become the norm for new commercial Earth observation systems.

The upside to so many satellites in orbit is that nearly every spot on the globe can be imaged several times throughout the day. This means the destruction from an explosion, storm or earthquake can usually be mapped within hours. Even more importantly, multiple satellite passes throughout the day and following days means dynamic ongoing incidents like floods and fires can be tracked continuously.

As noted, the downside is that the enormous volumes of data being captured so quickly

from different types of sensors make it difficult to find and analyze the right image for a given situation.



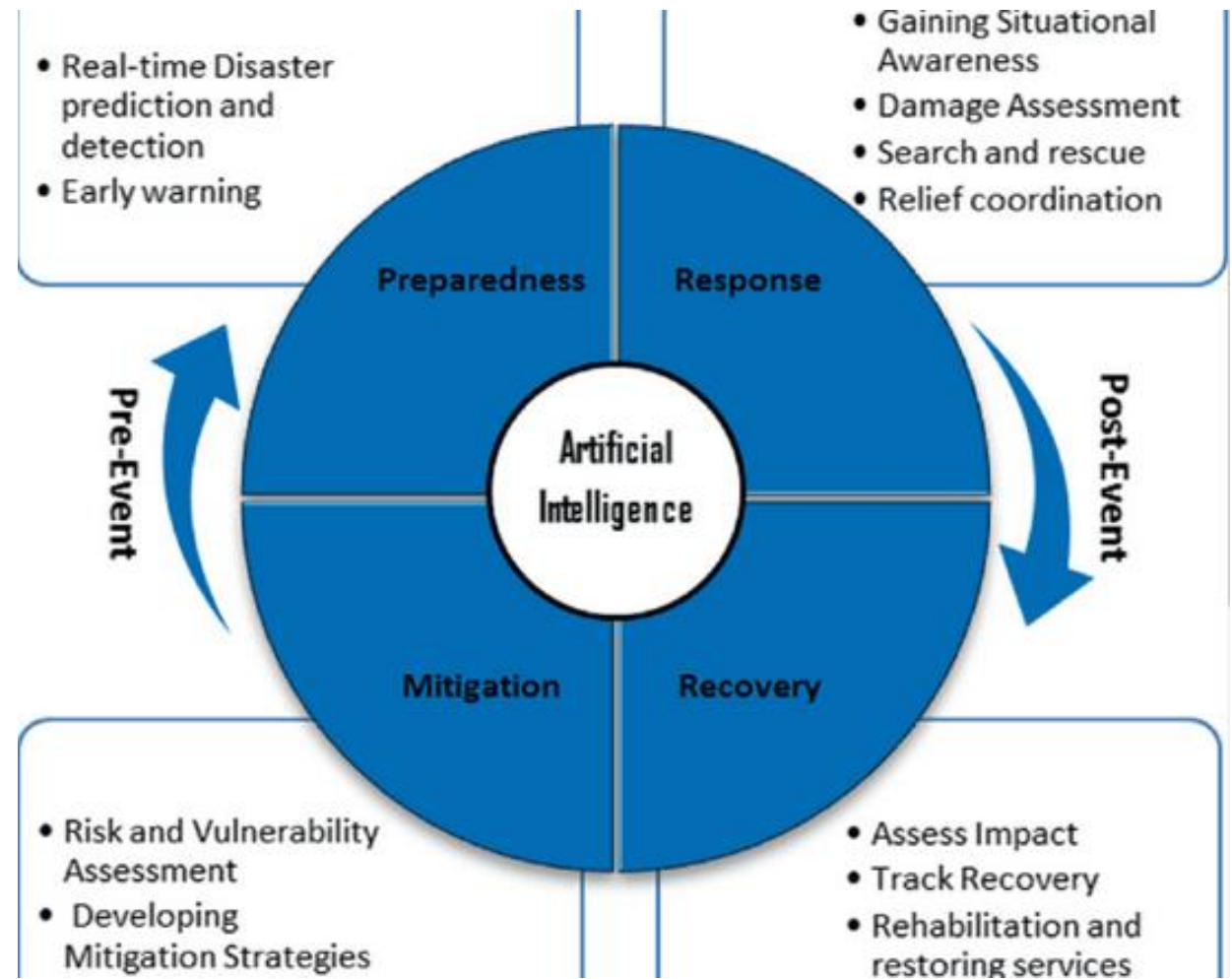
# CHALLENGES

The abundance of sensors has been a net positive for disaster planning and situational awareness, but it has also created new challenges related to dealing with all of this data. As sensor platforms have multiplied and their collected data files have become larger and more complex, incident commanders and others in the emergency response chain face at least three distinct challenges:

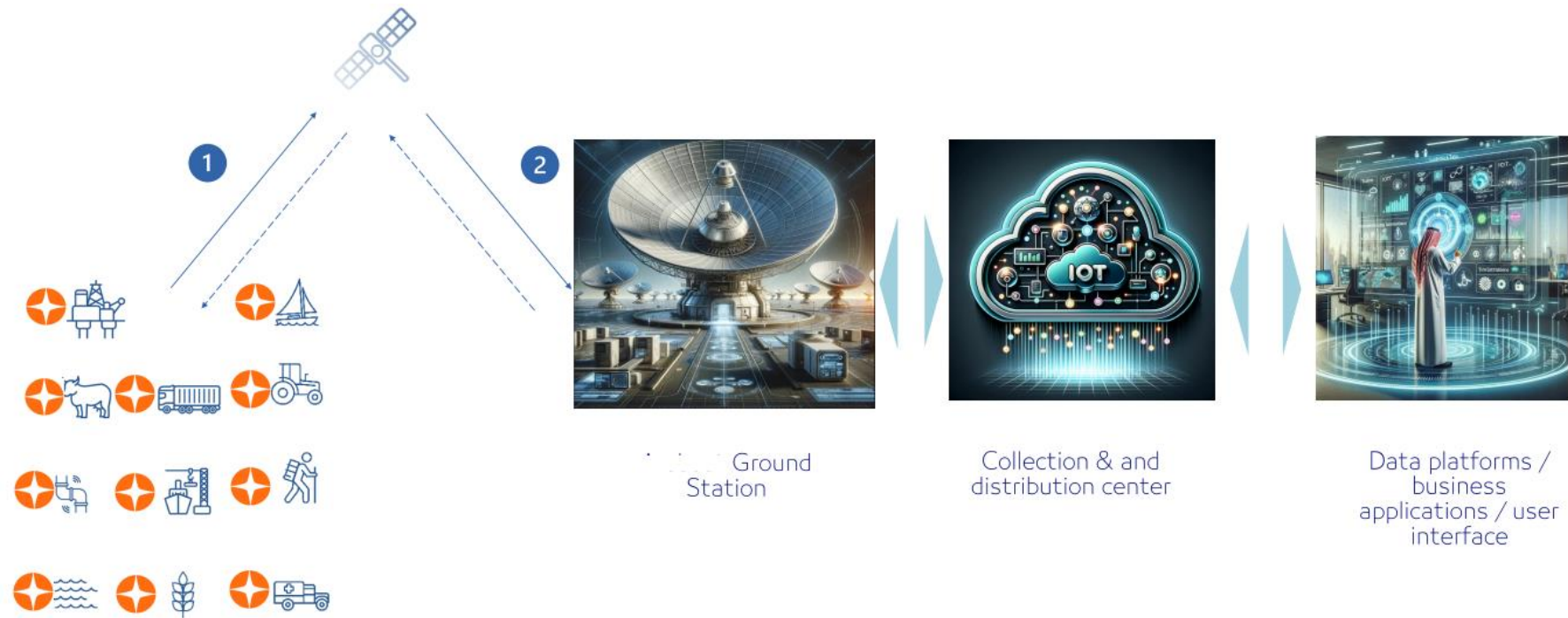
- Find the right data for a particular situation
- Analyze raw data to extract situational information
- Deliver actionable information to the front lines



# APPLICATIONS OF REMOTE SENSING IN DISASTER MANAGEMENT PHASES



# SATELLITE IOT SERVICES

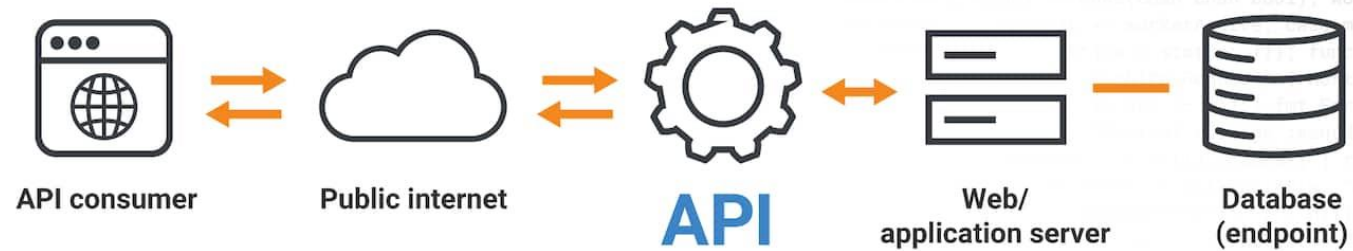


# DAMAGE ASSESSMENT

- SKAI Tools
- ENVI Deep Learning
- XBD Imagery Dataset



# INTEGRATING SATELLITE DATA INTO VARIOUS APPLICATIONS AND SYSTEMS



How a web API works

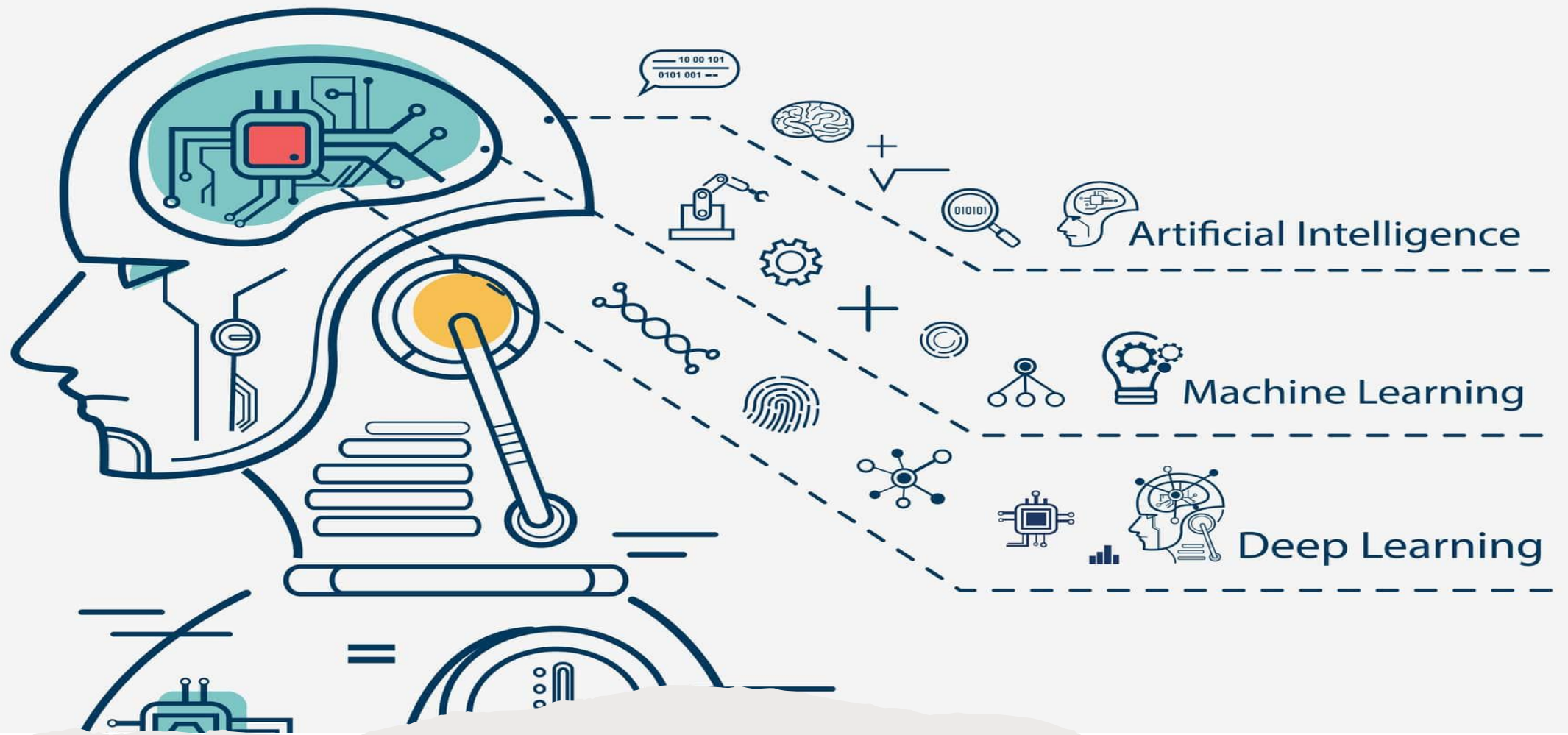




# INTEGRATING SATELLITE DATA INTO VARIOUS APPLICATIONS AND SYSTEMS

- **Identify Data Needs and Objectives:** Determine the specific requirements and objectives for integrating satellite data into your application or system. Consider factors such as the type of satellite data needed, spatial and temporal resolution requirements, data formats, and processing capabilities.
- **Select Appropriate Satellite Data:** Choose the most suitable satellite data sources based on your requirements and objectives. Consider factors such as the type of satellite (e.g., optical, radar, thermal), spectral bands, spatial resolution, temporal frequency, and data accessibility. There are numerous satellite data providers and repositories available, including government agencies (e.g., NASA, NOAA, ESA), commercial providers, and open data platforms.
- **Access and Acquire Satellite Data:** Access and acquire the selected satellite data through appropriate channels. Depending on the data source, you may be able to download data directly from online repositories, access data through web services or APIs, or obtain data through data distribution centers or commercial providers. Consider data access policies, licensing agreements, and data processing requirements when acquiring satellite data

- **Preprocess and Prepare Data:** Preprocess and prepare the satellite data for integration into your application or system. This may involve tasks such as data formatting, georeferencing, resampling, geometric correction, radiometric calibration, and atmospheric correction, depending on the specific characteristics of the satellite data and the requirements of your application. Ensure that the data is properly processed and quality-checked to ensure accuracy and reliability.
- **Integrate Data into Application or System:** Integrate the preprocessed satellite data into your application or system architecture. Depending on the nature of your application, this may involve importing the data into a geographic information system (GIS), integrating data into a software application or modeling tool, or incorporating data into a web-based or mobile application. Ensure compatibility with existing data formats, databases, APIs, and visualization tools.
- **Develop Data Analysis and Visualization Tools:** Develop data analysis and visualization tools to explore, analyze, and visualize the integrated satellite data within your application or system. This may involve developing custom algorithms, statistical models, or machine learning techniques for processing and interpreting satellite data, as well as designing interactive visualization interfaces for displaying data to end-users.
- **Validate and Evaluate Integration:** Validate and evaluate the integration of satellite data within your application or system. Perform rigorous testing, validation, and quality assurance procedures to ensure that the integrated data meets the requirements and objectives of your application. Solicit feedback from stakeholders and end-users to identify any issues or improvements needed in the integration process.
- **Maintain and Update Integration:** Maintain and update the integration of satellite data over time to ensure ongoing functionality, accuracy, and relevance. Monitor changes in satellite data availability, processing methods, and technology advancements, and incorporate updates or enhancements as needed to optimize the integration process and improve the performance of your application or system.



# ARTIFICIAL INTELLIGENCE

# TYPES OF MACHINE LEARNING:

Machine learning can be categorized into three main types:

- Supervised Learning
- Unsupervised Learning
- Reinforcement Learning



# WHAT IS MACHINE LEARNING?

01

Machine learning is a subset of artificial intelligence that focuses on developing algorithms and models that can learn from data and make predictions or decisions without being explicitly programmed to do so.

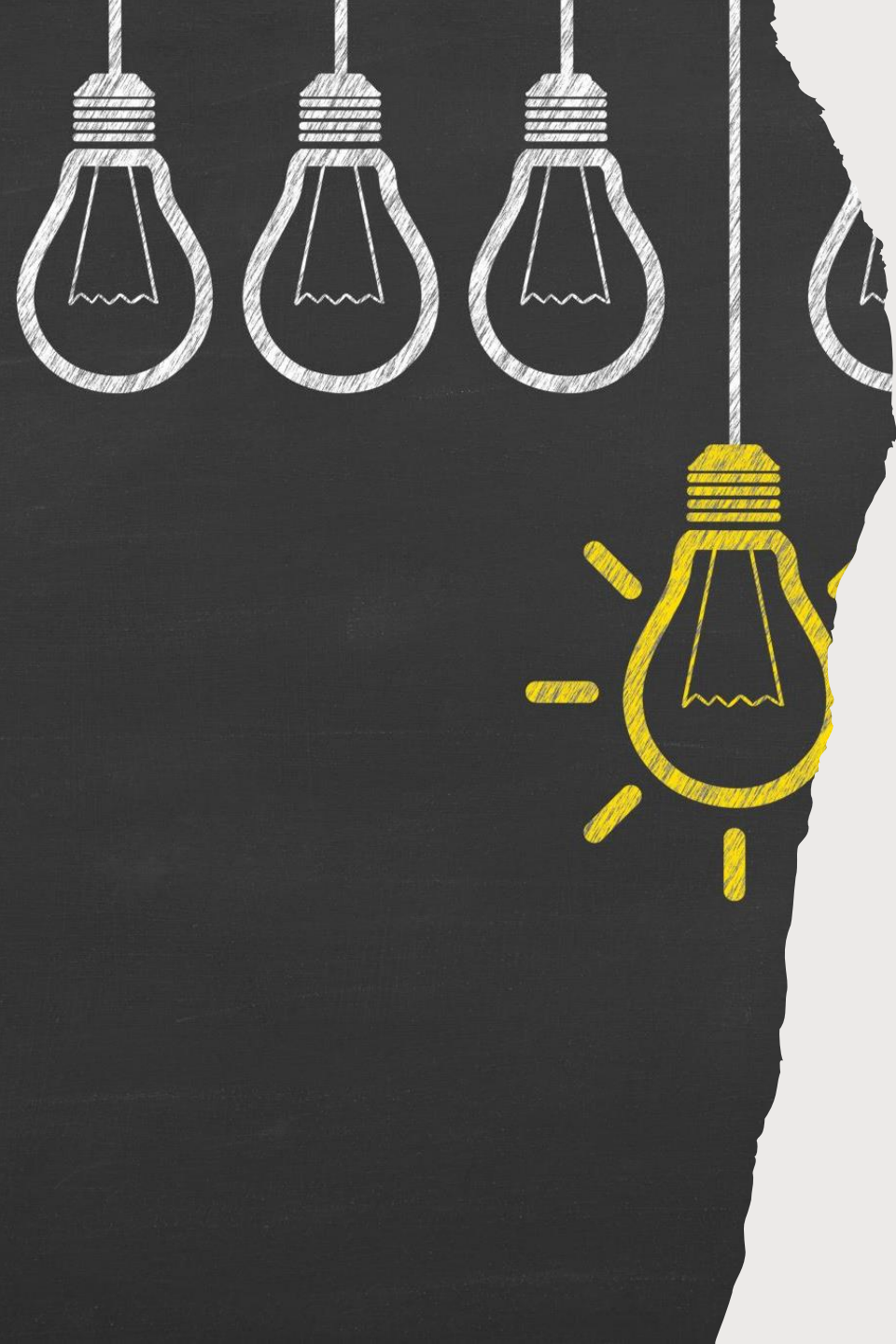
02

These algorithms are designed to make predictions or decisions based on patterns and insights extracted from data, which can be used for various applications such as image recognition, recommendation systems, and fraud detection.

03

Machine learning is a key technology behind various applications, from recommendation systems to image recognition, and it is used to analyze large amounts of data and identify patterns and trends that can be used to improve performance and efficiency.





# SUPERVISED LEARNING

- Supervised learning is a machine learning paradigm where the model is trained using labeled data.
- In supervised learning, the model learns to make predictions or classifications based on input features and known output labels.
- It's like teaching a computer to recognize patterns by showing it examples with clear answers.
- Common applications include image recognition, spam detection, and recommendation systems.

# EX. MESSAGE OR TWEET, DISASTER RESPONSE CATEGORY

Message	Category
There's a flood in my area! Please send help.	Flood
We need food and water supplies urgently.	Food Assistance
Someone is trapped under debris.	Rescue
Can't find my family. Please help.	Missing Persons
Fire outbreak in the neighborhood.	Fire
I have a medical emergency.	Medical Help
No electricity for two days.	Power Outage
Our house has collapsed.	Shelter Needed
We're running out of drinking water.	Water Supply
Please send blankets, it's very cold here.	Cold Weather
Lost my pet in the chaos. Need help finding it.	Animal Rescue
Help! I'm stuck in my car due to a landslide.	Landslide
Urgent: Gas leak reported in the vicinity.	Gas Leak

# "UNSUPERVISED LEARNING"

Unsupervised learning is a type of machine learning where the model is trained using unlabeled data.

The goal is to discover patterns or structures in the data without predefined output labels.

It's like letting the computer explore and find hidden insights in the data on its own.

Common applications include clustering, dimensionality reduction, and anomaly detection.



THANK YOU



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