

Data and Signals

13 November 2024 16:00

★ **Data** : Actual information being sent between devices or signals. Form like text, audio, video, imgs, etc or digital content that needs to be shared.

★ **Signal** : Physical representations of data. Can be electrical or electromagnetic impulses that carry the encoded information across cables, fiber optics or wireless channels.

Key Differences	Data & Signals
Nature	Data is the content or information itself while signal is physical form through which data is transmitted
Transmission	Data is what we want to communicate while signals are the means for communication
Processing	Computers handle data in its digital form, converting it into signals for transmission through physical mediums

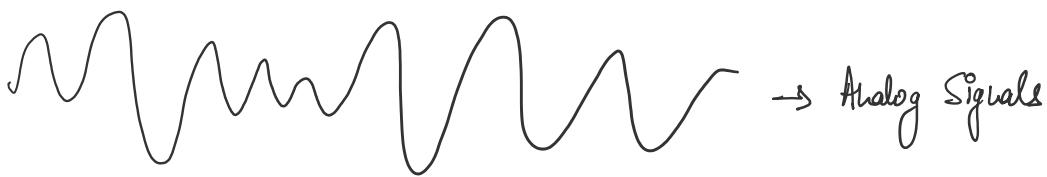
★ **Types of Data & Signals**

- Analog - Data that keeps changing over time (analog watch, etc)
- Digital - Represents information discretely at specific points in time; exact time displayed on a digital watch.

★ Analog Signals

- continuous waveforms that vary smoothly over time.
- can take on any value within a range & are typically represented as voltage or current levels.
- susceptible to noise & degradation over long distances, requiring amplification & filtering for reliable transmission.
- Eg: Audio signals, video signals, etc.

- Eg: Audio signals, video signals, etc.



* Digital Signals

- Discrete & Represent information using binary digits (bits 0/1)
- Encoded using precise voltage levels or frequencies
- Less susceptible to noise & distortion compared to analog signals
- Can be regenerated & transmitted over long distances without significant degradation
- Eg: Smartphones



Parameter	Analog Signal	Digital Signal
Nature	Convey information continuously over time.	Transmit data in discrete time signals
Representation	Represents data through continuous range of values	Binary values (0 and 1)
Bandwidth	Typically requires lower bandwidth	Requires higher bandwidth due to discrete signal pulses
Applications	Suitable for audio, video & natural phenomena monitoring	Used extensively in digital electronics & data processing
Noise Impact	Prone to interference affecting signal accuracy	Resistant to noise, ensuring high data transmission accuracy
Accuracy	Susceptible to inaccuracies due to noise & interference	Offers high accuracy & reliability in data representation
Power Consumption	Consumes more power due to continuous signal transmission	Requires less power due to intermittent signal transmission
Components	Analog components like resistors & capacitors	Relies on digital components such as transistors & logic gates
Examples	Temperature Sensors, Analog Cameras	Computers, Digital cameras & ...

Examples	Temperature Sensors, Analog Cameras such as Thermometers	Computers, Digital cameras & Smartphones.
----------	---	---