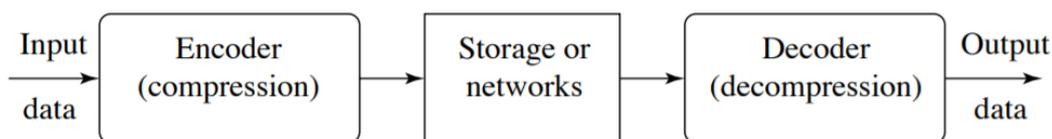


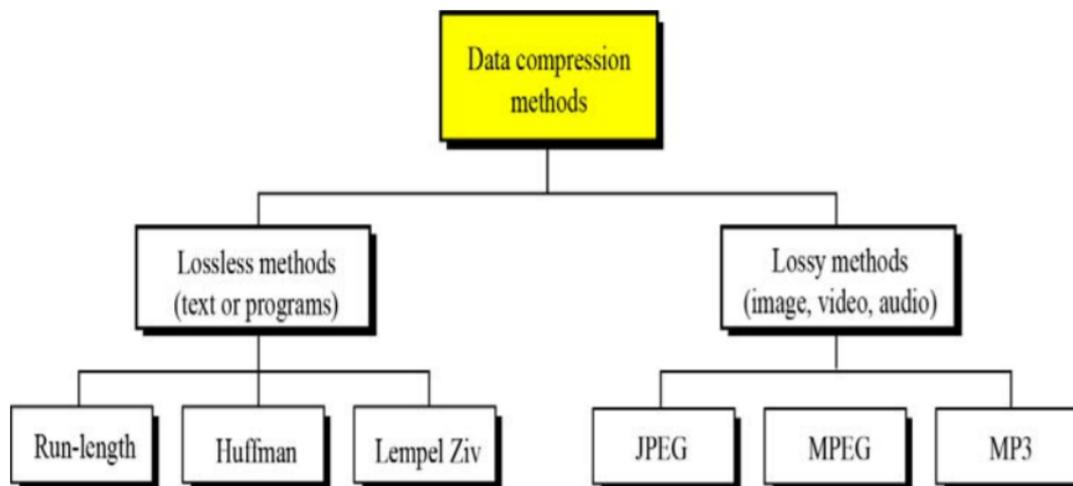
**Compression:** the process of coding that will effectively reduce the total number of bits needed to represent certain information.



A General Data Compression Scheme

Image compression is a type of data compression applied to digital images, to reduce their cost for storage or transmission.

- Lossy compression
- Lossless compression



If the compression and decompression processes induce no information loss, then the compression scheme is lossless; otherwise, it is lossy.

**Lossless compression:** In lossless data compression, the integrity of the data is preserved. The original data and the data after compression and decompression are exactly the same because, in these methods, the compression and decompression algorithms are exact inverses of each other: no part of the data is lost in the process.

Redundant data is removed in compression and added during decompression. Lossless compression methods are normally used when we cannot afford to lose any data.

**Lossy compression:** Our eyes and ears cannot distinguish subtle changes. In such cases, we can use a lossy data compression method. Lossy methods are

especially suitable for natural images such as photographs in applications where minor (sometimes imperceptible) loss of fidelity is acceptable to achieve a substantial reduction in bit rate.

Lossy compression that produces negligible differences may be called visually lossless.

**Lossless image compression techniques are:**

1. Run-length encoding – used in PCX, BMP, TGA, TIFF
2. variable-length coding (Huffman, Arithmetic Coding )
3. Bit Plane coding
4. DPCM and Predictive Coding
5. Entropy encoding
6. LZW coding
7. Adaptive dictionary algorithms – used in GIF and TIFF
8. Deflation – used in PNG, MNG, and TIFF
9. Chain codes

**Lossy compression techniques are:**

1. Reducing the color space.
  2. Chroma subsampling.
  3. Fractal compression
  4. Transform coding (DCT and Wavelet):
    - Discrete cosine transform (DCT) used in JPEG.
    - Wavelet transform (reversible or irreversible) used in JPEG2000
-

## **Run-length encoding**

It is a simplest data compression technique.

**Run-length encoding (RLE)** is a form of lossless data compression in which runs of data (sequences in which the same data value occurs in many consecutive data elements) are stored as a single data value and count, rather than as the original run. This is most useful on data that contains many such runs.

**The general idea behind this method is to replace consecutive repeating occurrences of a symbol by one occurrence of the symbol followed by the number of occurrences.**

For example, simple graphic images such as icons, line drawings etc.

Example 1: Suppose string is **AAAAAAA** then Run-length encoding is **A7** (A is character and 7 is number of times appear that string)

Example 2: If input string is **“WWWWAAADEXXXXXX”**, then the Run-length encoding is **W4A3D1E1X6**.