DATA COMPRESSION:

Data compression enables sending a data object or file quickly over a network or the Internet and in optimizing physical storage resources.

Data compression has wide implementation in computing services and solutions, specifically data communications. Data compression works through several compressing techniques and software solutions that utilize data compression algorithms to reduce the data size.

A common data compression technique removes and replaces repetitive data elements and symbols to reduce the data size. Data compression for graphical data can be lossless compression or lossy compression, where the former saves all replaces but save all repetitive data and the latter deletes all repetitive data.

LOSSY COMPRSSION:

In information technology, lossy compression **or irreversible** compression is **the class of data encoding methods that uses inexact approximations and partial data discarding to represent the content. These techniques are used to reduce data size for storing, handling, and transmitting content.**

LOSELESS COMPRESSION:

Lossless **formats use** compression **algorithms that preserve** audio **data so the** audio **is exactly the same as the original source. This contrasts with lossy** audio **formats such as AAC, MP3, and WMA, which** compress audio **using algorithms that discard data.** Audio **files are made up of sounds and silences.**

Difference between Lossy Compression and Lossless Compression

Data Compression refers to a technique where a large file to reduce to smaller sized file and can be decompressed again to the large file. Lossy compression restores the large file to its original form with loss of some data which can be considered as not-noticeable while lossless compression restores the large file to its original form without any loss of data.

Following are some of the important differences between Lossy Compression and Lossless Compression.

Sr. No.	Key	Lossy Compression	Lossless Compression
1	Data Elimination	Lossy compression eliminates those bytes which are considered as not-noticeable.	Lossless compression keeps even those bytes which are not-noticeable.
2	Restoration	After lossy compression, a file cannot be restored to its original form.	After lossless compression, a file can be restored to its original form.
3	Quality	Lossy compression leads to compromise with quality.	No quality degradation happens in lossless compression.
4	Size	Lossy compression reduces the size of file to large extent.	Lossless compression reduces the size but less as compared to lossy compression.
5	Algorithm used	Transform coding, Discrete Cosine Transform, Discrete Wavelet transform, fractal compression etc.	Run length encoding, Lempel-Ziv-Welch, Huffman Coding, Arithmetic encoding etc.
6	Uses	Lossy compression is used to compress audio, video and images.	Lossless compression is used to compress text, images and sound.
7	Capacity	Lossy compression technique has high data holding capacity.	Lossless compression has low data holding capacity as

Sr. No.	Key	Lossy Compression	Lossless Compression
			compared to lossy compression.

Audio Format

Audio format defines the quality and loss of audio data. Based on application different type of audio format are used. Audio formats are broadly divided into three parts:

1. Uncompressed Format
2. Lossy Compressed format
3. Lossless Compressed Format

1. Uncompressed Audio Format:

- **PCM –**
  It stands for Pulse-Code Modulation. It represents raw analog audio signals in digital form. To convert analog signal into digital signal it has to be recorded at a particular interval. Hence it has sampling rate and bit rate (bits used to represent each sample). It a exact representation of the analog sound and do not involve compression. It is the most common audio format used in CDs and DVDs

- **WAV –**
  It stands for Waveform Audio File Format; it was developed by Microsoft and IBM in 1991. It is just a Windows container for audio formats. That means that a WAV file can contain compressed audio. Most WAV files contain uncompressed audio in PCM format. It is just a wrapper. It is compatible with both Windows and Mac.
- **AIFF –**
  It stands for Audio Interchange File Format. It was developed by Apple for Mac systems in 1988. Like WAV files, AIFF files can contain multiple kinds of audio. It contains uncompressed audio in PCM format. It is just a wrapper for the PCM encoding. It is compatible with both Windows and Mac.

2. Lossy Compressed Format:

It is a form of compression that loses data during the compression process. But difference in quality no noticeable to hear.

- **MP3 –**
  It stands for MPEG-1 Audio Layer 3. It was released in 1993 and became popular. It is most popular audio format for music files. Main

aim of MP3 is to remove all those sounds which not hearable or less noticeable by humans' ears. Hence making size of music file small. MP3 is like universal format which is compatible almost every device.

- **AAC –**
  It stands for Advanced Audio Coding. It was developed in 1997 after MP3. The compression algorithm used by AAC is much more complex and advanced than MP3, so when compared a particular audio file in MP3 and AAC formats at the same bitrate, the AAC one will generally have better sound quality. It is the standard audio compression method used by YouTube, Android, iOS, iTunes, and PlayStations.
- **WMA –**
  It stands for Windows Media Audio. It was released in 1999.It was designed to remove some of the flaws of MP3 compression method. In terms of quality it is better than MP3. But is not widely used.

3. Lossless compression:

This method reduces file size without any loss in quality. But is not as good as lossy compression as the size of file compressed to lossy compression is 2 and 3 times more.

- **FLAC –**
  It stands for Free Lossless Audio Codec. It can compress a source file by up to 50% without losing data. It is most popular in its category and is open-source.
- **ALAC –**
  It stands for Apple Lossless Audio Codec. It was launched in 2004 and became free after 2011. It was developed by Apple.
- **WMA –**
  It stands for Windows Media Audio. But it is least efficient in term of compression and is not open-source. It has limited hardware support.

Video Format

Whenever a video file is saved it contains two files in it. One is the container and other is codecs. Container defines the structure of the video file and which codecs will be used. Codecs is used to compress and decompress video file.

Some of common container format are:

- **Flash Video Format (.flv)**
  This video format is very popular due to the availability of flash player for cross platform. These video files are supported by almost every browser making suitable for web. This format is compact and

support progressive and streaming download. Some users of this format are YouTube, Yahoo! Video, VEVO etc.

- **AVI format (.avi)**
  Audio Video Interleave which can contain both audio and video data. It was developed by Microsoft. It uses less compression can contain almost any codecs. It is popular among internet user due to multiple codecs support.
  This means that even if AVI files may look similar on the outside are different from one another on the inside
  All windows OS support this format including another player for other platform exist.

- **MP4 (.mp4)**
  This format is used to store to store audio and video stream online. MP4 file format was created by Moving Picture Experts Group (MPEG) as a multimedia container format store audio-visual data. It used different compression technique for video and audio.
- **3GP (.3gp)**
  This is both audio and video file format which was designed to transmit data between 3G phones and the internet. It is most commonly used to capture video from the phone and upload it online. Both Windows and Mac support the format.
- **WMV (Windows Media Video)**
  This format was developed by Microsoft. It was designed for web streaming applications. WMV files are the very small in size over the Web, as their file size decreases after compression, due to which results in poor video quality.
  But this make it only file format which can be send through e-mail.
- **QuickTime Format (.mov)**
  This format was developed by Apple. It can store multiple tracks(for different language), text file(subtitle) and effects. MOV files are of high quality and are usually big in file size.
  It is supported both by Windows and Apple.