

Data Compression

Unit-1

Mathematical preliminaries for lossless compression: Basic concepts of information theory; Models; Coding; Huffman coding: Overview; The Huffman coding algorithm; Minimum variance Huffman codes; Application of Huffman coding for text compression. Dictionary Techniques: Overview; Introduction; Static dictionary; Adaptive dictionary; Burrows-Wheeler Transform; Move-to-Front coding; Applications: UNIX compress, GIF, PNG, V.42. Lossless image compression: CALIC; JPEG-LS; Multi-resolution approaches; Facsimile encoding: Run-length coding, T.4 and T.6.

Unit-2

Lossy Coding: Introduction; distortion criteria; scalar quantization; quantization problem; uniform quantizer; adaptive quantization; Vector quantization: The LBG algorithm. Differential Encoding: The basic algorithm; Prediction in DPCM; Adaptive DPCM; Delta modulation; Speech coding; Image coding.

Unit-3

Transform coding: Mathematical concepts; DFT, DCT, DWHT, KLT; Quantization and coding for transform coefficients; Application to image compression - JPEG; MDCT. Sub-band coding: The basic subband coding algorithm; Bit allocation; Application to speech coding - G.722; Application to audio coding - MPEG audio; Application to image compression.

Unit-4

Wavelet-Based Compression: Overview; Introduction; Wavelets; Multiresolution and the scaling function; Implementation using Filters; Image compression; Embedded zero tree coder; Set partitioning in hierarchical trees; JPEG 2000.

Unit-5

Video Compression: Overview; Introduction; Motion compensation; Video signal representation; H.261; Model-based coding; Asymmetric applications; MPEG-1 and MPEG-2; H.263; H.264; MPEG-4 and advanced video coding; Packet video.

References

1. Khalid Sayood, "Introduction to data Compression", 4th edition, Morgan Kaufmann, 2013.
2. David Solomon, "Data Compression: The complete reference", 4th edition, Springer, 2007.

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