

EL 717: Digital Image Processing

Introduction: Digital image fundamentals, Brightness, Contrast and grey levels, Fundamentals steps in image processing.

Intensity Transformation and Spatial Filtering: Intensity Transformation, Histogram equalization, Histogram matching, smoothing and sharpening spatial filters.

Image Transforms: Introduction, Two-dimensional orthogonal and unitary transforms, Basis Images, Two-dimensional discrete Fourier transform, Cosine transform, Sine transform, Hadamard transform, Haar transform, KL transform, Wavelet transform.

Image Restoration: Noise models, Mean filters, Order-Statistics filters, Inverse filter, Wiener filter, Estimation of Degradation functions, Restoration from projections.

Image Compression: Fundamental Redundancy, Image Compression Models, Coding Theorems, Entropy, Error-Free Compression, Lossy Compression, LZW coding, Transform Coding, JPEG-2000 encoding, Lossless predictive coding, Lossy predictive coding .

Image Segmentation: Point, line detection, Edge detection, Boundary detection based techniques, Thresholding, Iterative thresholding, Region-based segmentation.

Morphological Image Processing: Erosion, Dilation, Opening, Closing, Hit-or-Miss Transform, Boundary Detection, Hole filling, Connected components, Convex hull, thinning, Thickening, Skeletons, Pruning, Morphological Reconstruction.

Text Books:

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson , Third Edition, 2009.
2. Anil K. Jain, Fundamentals of Digital Image Processing, Pearson, 2013.

Reference Books:

1. Rafael C. Gonzalez, Richard E. Woods, & Steve L. Eddins, Digital Image Processing using Matlab, Prentice-Hall, 1st edition, 2003, ISBN: 0130085197.
2. Kenneth R. Castelman, Digital Image Processing, Prentice-Hall, 1996.
3. William K. Pratt, Digital Image Processing, John Wiley & Sons Inc., 3rd edition, 2001.
4. S. Ahmed, Image Processing, McGraw -Hill, 1994.
5. S.J. Solari, Digital Video and Audio Compression, McGraw-Hill, 1997.