Contents :

□ 1. Pattern Recognition

- Introduction
- Patterns and pattern recognition
- Significance and function of pattern recognition systems
- Configuration of a pattern recognition system
- Representation of patterns and machine recognition approaches
- Paradigm applications
- Supervised and unsupervised learning

□ 2. Decision-Theoretic Classification

- Nonparametric decision theory
- Decision surfaces and discriminant functions
- Linear discriminant functions
- Piecewise linear discriminants
- Nonlinear discriminant functions
- Potential function classifiers

□ 3. Training of Discriminant Functions

- Nonparametric (distribution-free) training
- Weight space
- Error-correction learning
- Gradient-based methods

□ 4. Neural Networks for Pattern Recognition

- Multilayer perceptron (MLP)
- Radial basis function (RBF) networks
- Hamming network
- Kohonen self-organizing map (SOM)
- Hopfield network

□ 5. Data Preprocessing for Image Recognition

- Spatial domain preprocessing
- Gray-level transformations
- Histogram modification
- Noise smoothing
- Edge sharpening
- Morphological processing
- Boundary detection
- Texture analysis
- Shape extraction

□ 6. Shape Representation and Analysis

- Quadtree representation
- Voronoi diagrams
- Chain code
- Polygonal approximation
- B-spline representation
- Medial axis transform
- Fourier descriptors
- Shape recognition techniques
- Occluded object recognition

□ 7. Image Transforms and Frequency Domain Processing

- 2D Fourier transform
- Sampling theory
- FFT (Fast Fourier Transform)
- Other image transforms
- Image enhancement in transform domain

□ 8. Wavelets and Wavelet Transform

- Introduction to wavelets
- Scaling functions
- Filter banks
- Discrete wavelet transform (DWT)
- Applications of wavelets

□ 9. Applications

- Document image analysis
- Industrial inspection
- Remote sensing
- Vision-based control systems

□ 10. Practical Concerns in Image Processing

- Computer architectures for image processing
- SIMD systems
- Systolic arrays
- Interconnection networks

□ 11. Image Fundamentals and Mathematical Tools

- Digital image model
- Convolution
- Differential operators
- Sampling and quantization
- Matrix operations
- Eigenvalues and eigenvectors

□ Appendices

- Digital images
- Mathematical background
- Matrix algebra
- Notation and reference tools