



Computer Vision and Fuzzy-Neural Systems

By Arun D. Kulkarni

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Complete guide to applying fuzzy-neural systems in computer vision, introducing approaches that incorporate neural networks, fuzzy inference systems and fuzzy-neural network models into the fundamental models of computer vision systems. The CD-ROM features a library of MATLAB command files and other files for the text. System requirements not listed. DLC: Computer vision.

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Editorial Review

From the Inside Flap
PREFACE

Computer vision deals with extracting meaningful descriptions of physical objects from images. Computer vision has many practical applications such as remote sensing, medical image processing, robot vision, military reconnaissance, mineral exploration, cartography, forestry, etc. Recent developments in neural networks and fuzzy logic have changed the computer vision field dramatically. During the past few years there has been a large and energetic upswing in research efforts aimed at synthesizing fuzzy logic with neural networks. Neural networks provide algorithms for learning and are modeled after the physical architecture of the brain. Fuzzy logic deals with issues such as reasoning at the semantic or linguistic level and is based on the way brain deals with inexact information. Consequently, the two technologies complement each other. A variety of fuzzy-neural network models have been used in computer vision. This book deals with the topic of fuzzy-neural systems as applied to computer vision. The book provides exercises at the end of each chapter, and it can be used as a textbook for a course in computer vision at senior undergraduate or master degree level. The book also provides engineers, scientists, researchers, and students involved in computer vision a comprehensive, well-organized, up-to-date overview of recent techniques used in computer vision. The book is the outgrowth of my lecture notes in various classes that I taught at The University of Texas at Tyler. The material in the book is well tested in the classroom. It also has been published as journal articles and has been presented at various professional meetings.

Every effort has been made to produce a book that is easy to understand without oversimplification of the material. The mathematical level is well within grasp of a first-year graduate in a technical discipline such as engineering, computer science, or technology requiring preparation in classical set theory, discrete mathematics, matrix algebra, and computer programming. The textbook presents several worked-out examples along with MATLAB examples. All chapters contain exercises. AUDIENCE

This book is intended for use as a textbook for courses in computer vision, pattern recognition, or image processing at either the senior undergraduate level or first year graduate level. It is also suitable for use as a self-study guide by researchers, professionals, or engineers who want to learn about recent advances in computer vision and fuzzy-neural systems. Many techniques described in the book are also useful in data mining. ORGANIZATION

The book consists of ten chapters. Chapter 1 provides the overview of the book. Chapter 2 describes the fundamentals of computer vision. It describes various stages of a computer vision system. These stages can be implemented with conventional statistical techniques, neural networks, fuzzy inference systems, or fuzzy-neural network models. Chapter 3 and Chapter 4 describe fuzzy logic and neural network models, respectively. Chapter 5 describes pre-processing techniques such as radiometric or geometric corrections. Chapter 6 deals with feature extraction. Chapter 7 and Chapter 8 deal with supervised and unsupervised classification. Chapter 9 concerns with associative memories, and Chapter 10 presents various applications of computer vision. Topics such as remote sensing, medical image processing, data compression, data mining, character recognition, and stereovision are discussed in Chapter 10. The dependency chart for the chapters is shown in Figure P.1. The book covers material for two semesters in computer vision. Chapters 1 through 5 can be covered in the first semester and Chapters 6 through 10 can be covered during the second semester. For a one-semester course Chapters 1, 2, 3, 4, 5, 7, and 10 can be covered.

From the Back Cover

- New computer vision techniques based on neural networks, fuzzy inference systems, and fuzzy-neural network models
- Detailed tutorials, hands-on exercises, real-world examples, and proven algorithms

CD-ROM: code libraries for the MATLAB neural network, fuzzy logic, and image processing toolboxes, test images from Kodak and Space Imaging, and more.

The first complete guide to applying fuzzy-neural systems in computer vision.

Recent advances in neural networks and fuzzy logic are transforming the field of computer vision, making it possible for computer vision applications to learn much as the brain does, and to handle imprecise visual data far more effectively. Now, Dr. Arun D. Kulkarni brings together the field's latest research and applications, presenting the field's first comprehensive tutorial and reference.

Kulkarni starts by reviewing the fundamentals of computer vision, and the stages of a computer vision system. He shows how these stages have traditionally been implemented via statistical techniques; then introduces approaches that incorporate neural networks, fuzzy inference systems, and fuzzy-neural network models. Coverage includes:

- Preprocessing techniques such as radiometric or geometric corrections
- Feature extraction, supervised and unsupervised classification, associative memories, and other techniques for improving accuracy and performance
- Key computer vision applications: remote sensing, medical imaging, compression, data mining, character recognition, stereovision, and more

Computer Vision and Fuzzy-Neural Systems illuminates the state-of-the-art through hands-on exercises, real-world examples, and proven algorithms. It's an essential resource for every engineer, scientist, and programmer working in computer vision and a wide range of related fields. It can also be used as a textbook for undergraduate- or graduate-level courses in computer vision.

CD-ROM Included

Contains extensive library of MATLAB command files, executable files for some useful programs, and test images from Kodak and Space Imaging.

About the Author

Dr. Arun D. Kulkarni is Professor of Computer Science at The University of Texas at Tyler, Tyler, Texas. His research interests include computer vision, fuzzy-neural systems, data mining, image processing, and artificial intelligence. He has authored a book and published more than 50 referred papers. His awards include the 1984 Fulbright Fellowship award and the 1997 NASA/ASSE Summer Faculty Fellowship. Dr. Kulkarni obtained his Ph.D. from the Indian Institute of Technology, Bombay, and was a post-doctoral fellow at Virginia Tech.

Users Review

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