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explores how  
graphs—which

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are suitable to  
represent any  
discrete data  
by modeling  
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the perfect  
unified tool to  
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analyze images.  
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graphs are  
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addresses the basic  
concepts and  
techniques for  
designing content-  
based image and  
video retrieval  
systems. It also  
discusses a variety of  
design choices for the  
key components of

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these systems. This book gives a comprehensive survey of the content-based image retrieval systems, including several content-based video retrieval systems. The survey includes both research and commercial content-based retrieval systems. Content-

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Video Retrieval  
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includes pointers to  
two hundred  
representative  
bibliographic  
references on this  
field, ranging from  
survey papers to  
descriptions of recent  
work in the area,  
entire books and  
more than seventy  
websites. Finally, the

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book presents a  
detailed case study of  
designing MUSE – a  
content-based image  
retrieval system  
developed at Florida  
Atlantic University in  
Boca Raton, Florida.  
A complete  
introduction to the  
basic and  
intermediate concepts  
of image processing  
from the leading

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people in the field Up-to-date content, including statistical modeling of natural, anisotropic diffusion, image quality and the latest developments in JPEG 2000 This comprehensive and state-of-the art approach to image processing gives engineers and students a thorough

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"This book combines basic image processing techniques with some of the most advanced procedures.



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Introductory chapters dedicated to general principles are presented alongside detailed application-orientated ones. As a result it is suitably adapted for different classes of readers, ranging from Master to PhD students and beyond." – Prof. Jean-Philippe Thiran, EPFL, Lausanne,

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proceeds  
systematically from  
fundamentals to  
today's research  
frontiers. Professor  
Bovik, himself a highly  
respected leader in  
the field, has invited  
an all-star team of  
contributors.

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practitioners of image  
processing alike  
should benefit from  
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– Prof. Bernd Girod,  
Stanford University,  
USA "This book is  
informative, easy to  
read with plenty of  
examples, and allows  
great flexibility in  
tailoring a course on  
image processing or  
analysis." – Prof.

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Pamela Cosman,  
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California, San Diego,

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reference for all types  
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*This is a  
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*reconstruction  
with projection  
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strong focus on  
Computed  
Tomography  
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methods such as  
FBP, ART, SIRT,  
MLEM and OSEM  
are presented  
with modern  
and compact  
notation, with  
the main goal of  
guiding the



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mathematical  
background  
through a fast-  
route to real  
practice and  
computer  
implementation  
of the  
algorithms.*

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overview the  
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in the field, this  
guide will be  
invaluable for  
graduate*

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early-career  
researchers and  
scientists in  
medical physics  
and biomedical  
engineering who  
are beginners in  
the field of  
image  
reconstruction.*

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reconstruction  
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mathematical  
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move their first  
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image*

*reconstruction,  
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scientific  
programming  
language and  
toolsets Daniele  
Panetta is a*

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*researcher at  
the Institute of  
Clinical  
Physiology of  
the Italian  
National  
Research  
Council (CNR-  
IFC) in Pisa. He  
earned his MSc  
degree in  
Physics in 2004*

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specialisation  
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diploma in  
Matlab  
Health Physics  
in 2008, both at  
the University of  
Pisa. From 2005  
to 2007, he  
worked at the  
Department of  
Physics "E.  
Fermi" of the



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*University of  
Pisa in the field  
of tomographic  
image*

*reconstruction  
for small animal  
imaging micro-  
CT  
instrumentation.  
His current  
research at CNR-  
IFC has as its*

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*goal the  
identification of  
novel PET/CT  
imaging*

*biomarkers for  
cardiovascular  
and metabolic  
diseases. In the  
field micro-CT  
imaging, his  
interests cover  
applications of t*

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*three-dimensional morphometry of biosamples and scaffolds for regenerative medicine. He acts as reviewer for scientific journals in the field of Medical Imaging: Physics*

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*in Medicine and  
Biology, Medical  
Physics, Physica  
Medica, and  
others. Since  
2012, he is  
adjunct  
professor in  
Medical Physics  
at the University  
of Pisa. Niccolò  
Camarlinghi is a*

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*researcher at  
the University of  
Pisa. He  
obtained his  
MSc in Physics  
in 2007 and his  
PhD in Applied  
Physics in 2012.  
He has been  
working in the  
field of Medical  
Physics since*

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*2008 and his  
main research  
fields are*

*medical image  
analysis and  
image*

*reconstruction.*

*He is involved in  
the*

*development of  
clinical, pre-  
clinical PET and*

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*hadron therapy  
monitoring  
scanners. At the  
time of writing  
this book he was  
a lecturer at  
University of  
Pisa, teaching  
courses of life-  
sciences and  
medical physics  
laboratory. He*

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*regularly acts as  
a referee for the  
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This textbook  
presents the

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*fundamental  
concepts and  
methods for  
understanding  
and working  
with images and  
video in an  
unique, easy-to-  
read style which  
ensures the  
material is  
accessible to a*

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*wide audience.  
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than just the  
basics of image  
processing, the  
text provides a  
specific focus on  
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design and  
implementation  
of real systems  
for processing*

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acquisition,  
color images,

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*processing,*  
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*segmentation in*  
*video, tracking,*  
*geometric*  
*transformation,*  
*and visual*  
*effects; requires*

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*only a minimal  
understanding  
of mathematics;  
presents two  
chapters  
dedicated to  
applications;  
provides a guide  
to defining  
suitable values  
for parameters  
in video and*

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*image*  
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*systems, and to*  
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*conversion*  
*between the*  
*RGB color*  
*representation*  
*and the HIS,*  
*HSV and*  
*YUV/YCbCr color*  
*representations.*  
*A cookbook of*

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*algorithms for  
common image  
processing  
applications*  
*Thanks to  
advances in  
computer  
hardware and  
software,  
algorithms have  
been developed  
that support*



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*sophisticated  
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without  
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background in  
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book has been  
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aids. It's an  
ideal reference

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scientists, and  
other specialists  
who require  
highly  
specialized

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*exist for a wide*  
*variety of*  
*sophisticated*  
*image*  
*processing*  
*applications*  
*required by*  
*software*  
*engineers and*

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specialists This  
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has been  
completely  
updated to*

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classifier  
methods, and  
graphics cards  
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using distributed  
processing and  
GPU  
programming,  
and gives non-  
mathematicians  
the shortcuts*

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relatively  
sophisticated  
applications.  
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Vision, 2nd  
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the tools to*



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*image*  
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*AB®-oriented*

*approach in*

*order to*

*demonstrate the*

*most important*

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algorithms.*

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math, the  
contents are  
presented in a  
clear, objective  
manner,  
emphasizing  
and encouraging  
experimentation*

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*The book has  
been organized  
into two parts.*

*Part I: Image  
Processing  
begins with an  
overview of the  
field, then  
introduces the  
fundamental  
concepts,  
notation, and*

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associated with  
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and basic image  
processing  
operations.

Next, it  
discusses  
MATLAB® and  
its Image  
Processing

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activities and  
step-by-step  
tutorials. These  
chapters cover  
image  
acquisition and  
digitization;  
arithmetic, logic,*

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*and geometric  
operations;  
point-based, hist  
ogram-based,  
and neighborho  
od-based image  
enhancement  
techniques; the  
Fourier  
Transform and  
relevant frequen  
cy-domain*

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segmentation;  
image  
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*and coding; and  
feature  
extraction and  
representation.*

*Part II: Video  
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presents the  
main concepts  
and terminology  
associated with  
analog video  
signals and*

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*systems, as well  
as digital video  
formats and  
standards. It  
then describes  
the technically  
involved  
problem of  
standards  
conversion,  
discusses  
motion*

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*estimation and  
compensation  
techniques,  
shows how  
video sequences  
can be filtered,  
and concludes  
with an example  
of a solution to  
object detection  
and tracking in  
video sequences*

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*using MATLAB®.*  
*Extra features of  
this book  
include: More  
than 30  
MATLAB®  
tutorials, which  
consist of step-  
by-step guides  
to exploring  
image and video  
processing*

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exercises Useful  
websites and an  
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bibliographical

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is ideal for upper-  
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and graduate  
students in  
digital image  
and video  
processing  
courses, as well  
as for engineers,*

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variety of image  
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classification, object  
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and captioning with  
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techniques. This  
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great introduction to  
end-to-end deep

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training, evaluation,  
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Valliappa  
Lakshmanan, Martin  
Görner, and Ryan  
Gillard show you

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how to develop  
accurate and  
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models and put them  
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robust ML  
architecture in a  
flexible and  
maintainable way.  
You'll learn how to

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design, train,  
And Video  
evaluate, and predict  
Processing Using  
with models written  
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Keras. You'll learn  
how to: Design ML  
architecture for  
computer vision  
tasks Select a model  
(such as ResNet,  
SqueezeNet, or  
EfficientNet)

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task Create an end-to-  
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Incorporate  
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format, showing the  
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digital media aspects



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of Matlab (image,  
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language who would  
like to use Matlab as  
a tool for their image  
and video processing  
needs, and also  
comes in handy for

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photographers or  
video editors with  
even less  
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experience wanting  
to find an all-in-one  
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This book  
constitutes the  
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2006, held in  
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Hsinchu, Taiwan in  
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76 revised full  
papers and 58  
revised poster papers  
cover a wide range  
of topics, including  
all aspects of video  
and multimedia,

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both technical and  
artistic perspectives  
and both theoretical  
and practical issues.

The sampling lattice  
used to digitize  
continuous image  
data is a significant  
determinant of the  
quality of the  
resulting digital  
image, and therefore,

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of the efficacy of its  
processing. The  
nature of sampling  
lattices is intimately

tied to the  
tessellations of the  
underlying  
continuous image  
plane. To allow  
uniform sampling of  
arbitrary size  
images, the lattice

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needs to correspond to a regular - spatially repeatable - tessellation.

Although drawings and paintings from many ancient civilisations made ample use of regular triangular, square and hexagonal tessellations, and

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Euler later proved that these three are indeed the only three regular planar tessellations possible, sampling along only the square lattice has found use in forming digital images. The reasons for these are varied, including

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extensibility to higher dimensions, but the literature on the ramifications of this commitment to the square lattice for the dominant case of planar data is relatively limited.

There seems to be neither a book nor a survey paper on the



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subject of  
alternatives. This  
book on hexagonal  
image processing is  
therefore quite  
appropriate. Lee  
Middleton and  
Jayanthi Sivaswamy  
well motivate the  
need for a c- certedst  
udyofhexagonallattic  
eandimageprocessin

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ginterms of their know  
n uses in biological  
systems, as well as  
computational and  
other theoretical and  
practical advantages  
that accrue from this ap  
proach. They present t  
he state of the art of  
hexagonal image  
processing and a  
comparative study of

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And Video  
sampled using  
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hexagonal and  
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square grids.

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*Computer Vision is an essential guide to the implementation of image processing and computer vision techniques, with tutorial introductions and sample code in Matlab. Algorithms are presented and fully explained to enable complete understanding of the methods and*

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techniques  
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demonstrated. As  
one reviewer noted,  
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"The main strength  
of the proposed book  
is the exemplar code  
of the algorithms."  
Fully updated with  
the latest  
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feature extraction,  
including expanded  
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*edition contains  
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appendix on color*

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field Ideal module  
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with working  
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*image processing.  
Formal and  
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uses the image  
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*comprehensive  
website supports the  
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full source code for  
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a hands-on project  
book that shows you  
how to get the best  
results from OpenCV,  
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library. Computer  
vision is key to*

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technologies like  
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source library with  
over 2500 algorithms  
that you can use to  
do all of these, as  
well as track moving  
objects, extract 3D  
models, and overlay  
augmented reality.*

*It's used by major*

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*companies like Google (in its autonomous car), Intel, and Sony; and it is the backbone of the Robot Operating System's computer vision capability. In short, if you're working with computer vision at all, you need to know OpenCV. With*

*Practical OpenCV,*

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*you'll be able to: Get  
OpenCV up and  
running on Windows  
or Linux. Use  
OpenCV to control  
the camera board  
and run vision  
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Raspberry Pi.  
Understand what  
goes on behind the  
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vision applications  
like object detection,*



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*First Pacific Rim  
Symposium, PSIVT  
2006, Hsinchu,  
Taiwan, December  
10-13, 2006,  
Proceedings*

Gain insights into image-processing methodologies and algorithms, using machine learning and neural networks in Python. This book begins with the

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environment setup,  
understanding basic  
image-processing  
terminology, and  
exploring Python  
concepts that will be  
useful for  
implementing the  
algorithms discussed  
in the book. You will  
then cover all the  
core image  
processing  
algorithms in detail

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before moving onto  
the biggest computer  
vision library:

OpenCV. You ' ll see  
the OpenCV  
algorithms and how  
to use them for  
image processing.

The next section  
looks at advanced  
machine learning and  
deep learning  
methods for image  
processing and

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classification. You ' ll work with concepts such as pulse coupled neural networks, AdaBoost, XG boost, and convolutional neural networks for image-specific applications. Later you ' ll explore how models are made in real time and then deployed using various DevOps tools.

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Learning and Image

Processing are  
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learning algorithms  
for image processing  
Apply image-  
processing

techniques to five  
real-time projects

Who This Book Is For  
Data scientists and  
software developers  
interested in image  
processing and  
computer vision.

Fundamentals of  
Image, Audio, and

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introduces the  
Processing Using  
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concepts and  
principles of media  
processing and its  
applications in  
pattern recognition  
by adopting a hands-  
on approach using  
program  
implementations.  
The book covers the  
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for reading,  
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Features: Covers  
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concepts of image,  
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solving problems on  
media processing  
Discusses important  
features of Image  
Processing Toolbox,  
Audio System  
Toolbox, and  
Computer Vision  
Toolbox MATLAB®  
codes are provided as  
answers to specific  
problems Illustrates  
the use of Simulink  
for audio and video

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And Video  
processing  
techniques in both  
the Spatio-Temporal  
domain and  
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This is a perfect  
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graduate students  
studying courses on  
image processing,  
speech and language  
processing, signal

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multimedia  
technologies, with a  
focus on practical  
implementations  
using programming  
constructs and skill  
developments. It will  
also appeal to  
researchers in the  
field of pattern  
recognition,

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computer vision and  
And Video  
content-based  
retrieval, and for  
Processing Using  
students of  
MATLAB® courses  
dealing with media  
processing, statistical  
analysis, and data  
visualization. Dr.  
Ranjan Parekh, PhD  
(Engineering), is  
Professor at the  
School of Education  
Technology,

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Jadavpur University,  
Calcutta, India, and is  
involved with  
teaching subjects  
related to Graphics  
and Multimedia at  
the post-graduate  
level. His research  
interest includes  
multimedia  
information  
processing, pattern  
recognition, and  
computer vision.



## Where To Download

Useful as a reference work, this book offers a good balance between theoretical concepts and practical solutions, with more rigorous formulation of certain problems such as motion estimation, sampling, basic coding theory. Provides an in-depth exposition of

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fundamental theory  
and techniques for  
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including frequency  
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characterization of  
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visual perception,  
video sampling and  
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two dimensional and  
three dimensional  
motion estimation.

Also presents

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techniques important  
for video  
communications,  
including video  
coding and error  
control, and up-to-  
date coverage on  
recent international  
standards on video  
communications. A  
chapter is devoted to  
video streaming over  
Internet and wireless  
networks, one of the

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most popular video  
communication

applications. In

addition, it discusses

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Practicing

researchers and

engineers.

This is an

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intermediate level

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text on the science of image processing, which employs the Matlab programming language to illustrate some of the elementary, key concepts in modern image processing and pattern recognition. The approach taken is essentially practical and the book offers a

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framework within  
which the concepts  
can be understood by  
a series of well  
chosen examples,  
exercises and  
computer  
experiments,  
drawing on specific  
examples from within  
science, medicine  
and engineering.  
Clearly divided into  
eleven distinct

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chapters, the book begins with a fast-start introduction to image processing to enhance the accessibility of later topics. Subsequent chapters offer increasingly advanced discussion of topics involving more challenging concepts, with the final chapter looking

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at the application of  
automated image  
classification (with  
Matlab examples) .

Matlab is frequently  
used in the book as a  
tool for  
demonstrations,  
conducting  
experiments and for  
solving problems, as  
it is both ideally  
suited to this role and  
is widely available.



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Prior experience of Matlab is not required and those without access to Matlab can still benefit from the independent presentation of topics and numerous examples. Features a companion website [www.wiley.com/go/solomon/fundamentals](http://www.wiley.com/go/solomon/fundamentals) containing a Matlab

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fast-start primer,  
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information.  
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is often  
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results in  
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background,  
small amounts  
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minimal code.  
How? With  
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to provide a  
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Authors Jeremy  
Howard and  
Sylvain

Gugger, the  
creators of  
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you how to  
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on a wide  
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to random  
processes and  
some essential  
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concepts that  
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