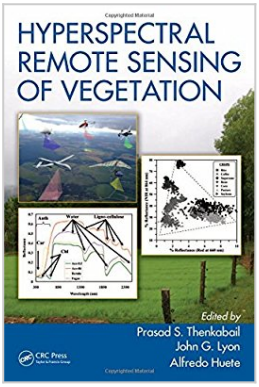

Hyperspectral Remote Sensing of Vegetation

From CRC Press

Hyperspectral Remote Sensing of Vegetation From CRC Press

Hyperspectral narrow-band (or imaging spectroscopy) spectral data are fast emerging as practical solutions in modeling and mapping vegetation. Recent research has demonstrated the advances in and merit of hyperspectral data in a range of applications including quantifying agricultural crops, modeling forest canopy biochemical properties, detecting crop stress and disease, mapping leaf chlorophyll content as it influences crop production, identifying plants affected by contaminants such as arsenic, demonstrating sensitivity to plant nitrogen content, classifying vegetation species and type, characterizing wetlands, and mapping invasive species. The need for significant improvements in quantifying, modeling, and mapping plant chemical, physical, and water properties is more critical than ever before to reduce uncertainties in our understanding of the Earth and to better sustain it. There is also a need for a synthesis of the vast knowledge spread throughout the literature from more than 40 years of research.

Hyperspectral Remote Sensing of Vegetation integrates this knowledge, guiding readers to harness the capabilities of the most recent advances in applying hyperspectral remote sensing technology to the study of terrestrial vegetation. Taking a practical approach to a complex subject, the book demonstrates the experience, utility, methods and models used in studying vegetation using hyperspectral data. Written by leading experts, including pioneers in the field, each chapter presents specific applications, reviews existing state-of-the-art knowledge, highlights the advances made, and provides guidance for the appropriate use of hyperspectral data in the study of vegetation as well as its numerous applications, such as crop yield modeling, crop and vegetation biophysical and biochemical property characterization, and crop moisture assessment.

This comprehensive book brings together the best global expertise on hyperspectral remote sensing of agriculture, crop water use, plant species detection, vegetation classification, biophysical and biochemical modeling, crop productivity and water productivity mapping, and modeling. It provides the pertinent facts, synthesizing findings so that readers can get the correct picture on issues such as the best wavebands for their practical applications, methods of analysis using whole spectra, hyperspectral vegetation indices targeted to study

specific biophysical and biochemical quantities, and methods for detecting parameters such as crop moisture variability, chlorophyll content, and stress levels. A collective "knowledge bank," it guides professionals to adopt the best practices for their own work.

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Editorial Review

Review

"The authors solicited the help of numerous high-quality hyperspectral remote sensing scientists to write this book. The characteristics of hyperspectral remote sensing systems are explained clearly. Fundamental hyperspectral data analysis, hyperspectral indices, and data mining methods are introduced. I am particularly impressed with the in-depth treatment on leaf and plant biophysical and biochemical properties, especially related to remote sensing of: chlorophyll content, leaf nitrogen concentration, photosynthetic efficiency, quantifying plant litter, leaf-area-index, and vegetation stress detection. The book documents numerous practical applications of hyperspectral remote sensing for forest management, precision farming, monitoring invasive species, and local to global land cover change detection. No other book contains such detailed information about hyperspectral remote sensing of vegetation."
?Dr. John R. Jensen, PhD, Carolina Distinguished Professor, Department of Geography, University of South Carolina, Columbia, USA

Hyperspectral Remote Sensing of Vegetation fills an important gap in today's literature. This comprehensive text covers all aspects of hyperspectral sensing of plants and vegetation, from sensor systems, data mining, biophysical properties and plant functioning, to species mapping and land cover applications. This book will greatly increase the research communities' understanding of how to use hyperspectral data to solve otherwise intractable problems in plant applications from crops to forests.
?Susan L. Ustin, Professor of Environmental and Resource Sciences, Department of Land, Air, and Water Resources, University of California at Davis, USA

"Hyperspectral Remote Sensing of Vegetation provides excellent coverage of the research and application of high spectral resolution measurements for vegetation mapping, monitoring and analysis. This book brings together an enormous range of topical areas, leaving the reader with a much improved understanding of the vital role and use of the hyperspectral sensing for plant and ecosystem studies."
?Greg Asner, Professor, Department of Global Ecology, Carnegie Institution for Science, Stanford University, California, USA

"The publication of this book, **Hyperspectral Remote Sensing of Vegetation**, marks a milestone in the application of imaging spectrometry to studies of the 70% of the Earth's landmass which is vegetated. This book shows not only the breadth of international involvement in the use of hyperspectral data but also in the breadth of innovative application of mathematical techniques to extract information from the image data."
?From the Foreword by Alexander F. H. Goetz, Chairman and Chief Scientist, Analytical Spectral Devices Inc., Boulder, Colorado, USA

"I would highly recommend [this book] to anyone dealing with the subject. … very well written … The following anecdote illustrates of the usefulness of the book. When I received my copy at work, colleagues were quickly interested and browsing through it. Soon after I took the book home for review, my colleagues kept on asking me when I was returning it to work, so they could start using it."
?Dr. Pieter Kempeneers, VITO, Belgium, in earthzine

About the Author

Dr. Prasad S. Thenkabail has more than 25 years experience working as a well recognized international expert in remote sensing and geographic information systems and their applications to agriculture, natural resource management, water resources, sustainable development, and environmental studies. His work experience spans over 25 countries spread across West and Central Africa, Southern Africa, South Asia, Southeast Asia, the Middle East, East Asia, Central Asia, North America, South America, and the Pacific. Dr. Thenkabail has a wealth of work experience in premier global institutes, holding key lead research positions. He is a member of the Landsat Science Team (2007-2011) and is on the editorial boards of two remote sensing journals, *Remote Sensing of Environment* and *Journal of Remote Sensing*. He led the global irrigated area mapping (GIAM) project and the global mapping of rainfed croplands (GMRCA) project, and has conducted pioneering work in hyperspectral remote sensing. Currently, he is a research geographer at the U.S. Geological Survey (USGS) and a coordinator of the Committee for Earth Observation Systems (CEOS) Agriculture Societal Beneficial Area (SBA). He co-leads an IEEE Water for the World Project and is an active participant in Group on Earth Observations (GEO) and the Global Earth Observation System of Systems (GEOSS) and CEOS activities. Dr. Thenkabail has more than 80 publications, mostly peer-reviewed and published in major international remote sensing journals. He is the chief editor of two pioneering books, *Remote Sensing of Global Croplands for Food Security* (2009) and *Hyperspectral Remote Sensing of Vegetation* (2011).

Dr. John G. Lyon's research has involved advanced remote sensing and GIS applications to water and wetland resources, agriculture, natural resources, and engineering applications. He is the author of books on wetland landscape characterization, wetland and environmental applications of GIS, and accuracy assessment of GIS and remote sensing technologies. Lyon currently serves as a senior scientist (ST) in the EPA Office of the Science Advisor in Washington, District of Columbia, and is co-lead for work on the Group on Earth Observations and the Global Earth Observation System of Systems, and research on geospatial issues in the agency.

Dr. Alfredo Huete is currently a professor in the Faculty of Science, Plant Functional Biology and Climate Change Cluster, at the University of Technology Sydney, Australia. Dr. Huete's research interests focus on understanding large-scale soil–vegetation–climate interactions, processes, and changes with remotely sensed measurements from satellites. He is also involved with field-based and tower optical instrumentation in support of remote sensing studies coupling satellite observations with eddy covariance tower flux measurements. He has done extensive research in the phenology of tropical rain forests and savannas in the Amazon and Southeast Asia and has over 100 research publications in peer-reviewed journals, a book, and more than 20 chapter contributions.

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