Efficient Crop Type Mapping Based On Remote Sensing In The

Efficient Crop Type Mapping Based on Remote Sensing in the Central Valley, California Liheng Zhong 2012 Most agricultural systems in California's Central Valley are purposely flexible and intentionally designed to meet the demands of dynamic markets. Agricultural land use is also impacted by climate change and urban development. As a result, crops change annually and semiannually, which makes estimating agricultural water use difficult, especially given the existing method by which agricultural land use is identified and mapped. A minor portion of agricultural land is surveyed annually for land-use type, and every 5 to 8 years the entire valley is completely evaluated. So far no effort has been made to effectively and efficiently identify specific crop types on an annual basis in this area. The potential of satellite imagery to map agricultural land cover and estimate water usage in the Central Valley is explored. Efforts are made to minimize the cost and reduce the time of production during the mapping process. The land use change analysis shows that a remote sensing based mapping method is the only means to map the frequent change of major crop types. The traditional maximum likelihood classification approach is first utilized to map crop types to test the classification capacity of existing algorithms. High accuracy is achieved with sufficient ground truth data for training, and crop maps of moderate quality can be timely produced to facilitate a near-real-time water use estimate. However, the large set of ground truth data required by this method results in high costs in data collection. It is difficult to

reduce the cost because a trained classification algorithm is not transferable between different years or different regions. A phenology based classification (PBC) approach is developed which extracts phenological metrics from annual vegetation index profiles and identifies crop types based on these metrics using decision trees. According to the comparison with traditional maximum likelihood classification, this phenology-based approach shows great advantages when the size of the training set is limited by ground truth availability. Once developed, the classifier is able to be applied to different years and a vast area with only a few adjustments according to local agricultural and annual weather conditions. 250 m MODIS imagery is utilized as the main input to the PBC algorithm and displays promising capacity in crop identification in several counties in the Central Valley. A time series of Landsat TM/ETM+ images at a 30 m resolution is necessary in the crop mapping of counties with smaller land parcels, although the processing time is longer. Spectral characteristics are also employed to identify crops in PBC. Spectral signatures are associated with phenological stages instead of imaging dates, which highly increases the stability of the classifier performance and overcomes the problem of over-fitting. Moderate accuracies are achieved by PBC, with confusions mostly within the same crop categories. Based on a quantitative analysis, misclassification in PBC has very trivial impacts on the accuracy of agricultural water use estimate. The cost of the entire PBC procedure is controlled to a very low level, which will enable its usage in routine annual crop mapping in the Central Valley.

Agro-geoinformatics Liping Di 2021-04-12 This volume collects and presents the fundamentals, tools, and processes of utilizing geospatial information technologies to process remotely sensed data for use in agricultural monitoring and management. The issues related to handling digital agro-geoinformation, such as collecting (including field visits and remote sensing), processing,

storing, archiving, preservation, retrieving, transmitting, accessing, visualization, analyzing, synthesizing, presenting, and disseminating agro-geoinformation have never before been systematically documented in one volume. The book is edited by International Conference on Agro-Geoinformatics organizers Dr. Liping Di (George Mason University), who coined the term "Agro-Geoinformatics" in 2012, and Dr. Berk Üstündağ (Istanbul Technical University) and are uniquely positioned to curate and edit this foundational text. The book is composed of eighteen chapters that can each stand alone but also build on each other to give the reader a comprehensive understanding of agro-geoinformatics and what the tools and processes that compose the field can accomplish. Topics covered include land parcel identification, image processing in agricultural observation systems, databasing and managing agricultural data, crop status monitoring, moisture and evapotranspiration assessment, flood damage monitoring, agricultural decision support systems and more.

Use of Earth Observations for Actionable Decision Making in the Developing World Niall Patrick Hanan 2021-01-13
Investing in carbon neutrality: Utopia or the new green wave? Santos, N., Monzini Taccone di Sitizano, J., Pedersen, E., Borgomeo, E. 2022-06-17 The world's agrifood systems are on the frontlines of climate change, both as a cause and a victim. The agrifood sector is increasingly being targeted and curbing emissions is becoming a key global investment and policy theme. 'Investing in carbon neutrality: utopia or the new green wave?' presents a comprehensive assessment of the key challenges and opportunities of carbon neutrality, and scopes out the road ahead for agrifood systems. It provides strategic insights on the actions needed to move the carbon neutrality agenda forward in terms of investment opportunities and public policy priorities, with important recommendations for development partners. This publication is part of the Directions in Investment series under

the FAO Investment Centre's Knowledge for Investment (K4I) programme.

Digital Mapping of Soil Landscape Parameters Pradeep Kumar Garg 2020-02-20 This book addresses the mapping of soil-landscape parameters in the geospatial domain. It begins by discussing the fundamental concepts, and then explains how machine learning and geomatics can be applied for more efficient mapping and to improve our understanding and management of 'soil'. The judicious utilization of a piece of land is one of the biggest and most important current challenges, especially in light of the rapid global urbanization, which requires continuous monitoring of resource consumption. The book provides a clear overview of how machine learning can be used to analyze remote sensing data to monitor the key parameters, below, at, and above the surface. It not only offers insights into the approaches, but also allows readers to learn about the challenges and issues associated with the digital mapping of these parameters and to gain a better understanding of the selection of data to represent soil-landscape relationships as well as the complex and interconnected links between soil-landscape parameters under a range of soil and climatic conditions. Lastly, the book sheds light on using the network of satellite-based Earth observations to provide solutions toward smart farming and smart land management.

Advanced Applications in Remote Sensing of Agricultural Crops and Natural Vegetation Prasad S. Thenkabail 2018-12-07 Written by leading global experts, including pioneers in the field, the four-volume set on Hyperspectral Remote Sensing of Vegetation, Second Edition, reviews existing state-of-the-art knowledge, highlights advances made in different areas, and provides guidance for the appropriate use of hyperspectral data in the study and management of agricultural crops and natural vegetation. Volume IV, Advanced Applications in Remote Sensing of Agricultural Crops and Natural Vegetation discusses the use of

hyperspectral or imaging spectroscopy data in numerous specific and advanced applications, such as forest management, precision farming, managing invasive species, and local to global land cover change detection. It emphasizes the importance of hyperspectral remote sensing tools for studying vegetation processes and functions as well as the appropriate use of hyperspectral data for vegetation management practices. The concluding chapter provides readers with useful guidance on the highlights and essence of Volume IV through the editors' perspective. Key Features of Volume IV: Guides readers to harness the capabilities of the most recent advances in applying hyperspectral remote sensing technology to the study of terrestrial vegetation. Includes specific applications on agriculture, crop management practices, study of crop stress and diseases, crop characteristics based on inputs (e.g., nitrogen, irrigation), study of vegetation impacted by heavy metals, gross and net primary productivity studies, light use efficiency studies, crop water use and actual evapotranspiration studies, phenology monitoring, land use and land cover studies, global change studies, plant species detection, wetland and forest characterization and mapping, crop productivity and crop water productivity mapping, and modeling. Encompasses hyperspectral or imaging spectroscopy data in narrow wavebands used across visible, red-edge, near-infrared, far-infrared, shortwave infrared, and thermal portions of the spectrum. Explains the implementation of hyperspectral remote sensing data processing mechanisms in a standard, fast, and efficient manner for their applications. Discusses cloud computing to overcome hyperspectral remote sensing massive big data challenges. Provides hyperspectral analysis of rocky surfaces on the earth and other planetary systems.

Renewable Resources Remote Sensing Research Program Dennis G. Dye 1983

Applications of Remote Sensing in Agriculture M. D. Steven 2013-10-22 Applications of Remote Sensing in Agriculture

contains the proceedings of the 48th Easter School in Agricultural Science, held at the University of Nottingham on April 3-7, 1989. The meeting invites 146 delegates from over 22 countries and contributions to this book come from nine countries. This book generally presents a review of the achievements of remote sensing in agriculture, establishes the state of the art, and gives pointers to developments. This text is organized into seven parts, wherein Parts I-III cover the principles of remote sensing, climate, soil, land classification, and crop inventories. Productivity; stress; techniques for agricultural applications; and opportunities, progress, and prospects in the field of remote sensing in agriculture are also discussed.

Handbook of Irrigation Hydrology and Management Saeid Eslamian 2023-05-31 Ever-increasing population growth has caused a proportional increased demand for water, and existing water sources are depleting day by day. Moreover, with the impact of climate change, the rates of rainfall in many regions have experienced a higher degree of variability. In many cities, government utilities have been struggling to maintain sufficient water for the residents and other users. The Handbook of Irrigation Hydrology and Management: Irrigation Case Studies examines and analyzes irrigated ecosystems in which water storage, applications, or drainage volumes are artificially controlled in the landscape and the spatial domain of processes varies from micrometers to tens of kilometers, while the temporal domain spans from seconds to centuries. The continuum science of irrigation hydrology includes the surface, subsurface (unsaturated and groundwater systems), atmospheric, and plant subsystems. Further, the book includes practical case studies from around the world, including locations such as Africa, Australia, China, India, the Middle East, the United States, and more. Features: Offers water-saving strategies to increase the judicious use of scarce water resources Presents strategies to maximize agricultural yield per unit of water used for different

regions Compares irrigation methods to offset changing weather patterns and impacts of climate change

Geospatial Technologies for Effective Land Governance El-Ayachi, Moha 2018-10-12 Land, as a fundamental resource in regional development, provides major opportunities for farming, housing, urban planning, and financing. In order to meet the requirements of the new era, every state has developed and implemented a series of policies according to its national specificities and to the international regulations and trends. Geospatial Technologies for Effective Land Governance is a pivotal reference source that provides vital research on the application of the use of GNSS, remote sensing, and GIS. While highlighting topics such as crop management, multispectral images, and irrigation, this publication explores land administration, encompassing both cadastral systems and land registration, as well as the methods of land governance strategies. This book is ideally designed for researchers, agricultural professionals, engineers, environmentalists, land developers, educators, students, and policymakers seeking current research on land and land-based conflicts in urban and rural communities.

Advances in Remote Sensing for Natural Resource Monitoring Prem C. Pandey 2021-01-18 Sustainable management of natural resources is an urgent need, given the changing climatic conditions of Earth systems. The ability to monitor natural resources precisely and accurately is increasingly important. New and advanced remote sensing tools and techniques are continually being developed to monitor and manage natural resources in an effective way. Remote sensing technology uses electromagnetic sensors to record, measure and monitor even small variations in natural resources. The addition of new remote sensing datasets, processing techniques and software makes remote sensing an exact and cost-effective tool and technology for natural resource monitoring and management.

Advances in Remote Sensing for Natural Resources Monitoring provides a detailed overview of the potential applications of advanced satellite data in natural resource monitoring. The book determines how environmental and - ecological knowledge and satellite-based information can be effectively combined to address a wide array of current natural resource management needs. Each chapter covers different aspects of remote sensing approach to monitor the natural resources effectively, to provide a platform for decision and policy. This important work: Provides comprehensive coverage of advances and applications of remote sensing in natural resources monitoring Includes new and emerging approaches for resource monitoring with case studies Covers different aspects of forest, water, soil- land resources, and agriculture Provides exemplary illustration of themes such as glaciers, surface runoff, ground water potential and soil moisture content with temporal analysis Covers blue carbon, seawater intrusion, playa wetlands, and wetland inundation with case studies Showcases disaster studies s

Remote Sensing Applications in Environmental and Earth System Sciences Nicolas R. Dalezios 2021-05-12 Remote Sensing Applications in Environmental and Earth System Sciences is a contemporary, multi-disciplinary, multi-scaling, updated, and upgraded approach of applied remote sensing in the environment. The book begins with an overview of remote sensing technology, and then explains the types of data that can be used as well as the image processing and analysis methods that can be applied to each type of application through the use of case studies throughout. Includes a wide spectrum of environmental applications and issues Explains methodological image analysis and interpretation procedures for conducting a variety of environmental analyses Discusses the development of early warning systems Covers monitoring of the environment as a whole – atmosphere, land, and water Explores the latest remote sensing systems in environmental applications This book is an

excellent resource for anyone who is interested in remote sensing technologies and their use in Earth systems, natural resources, and environmental science.

Hyperspectral Satellites and System Design Shen-En Qian 2020-04-22 Hyperspectral Satellites and System Design is the first book on this subject. It provides a systematic analysis and detailed design of the entire development process of hyperspectral satellites. Derived from the author's 25-year firsthand experience as a technical lead of space missions at the Canadian Space Agency, the book offers engineers, scientists, and decision-makers detailed knowledge and guidelines on hyperspectral satellite system design, trade-offs, performance modeling and simulation, optimization from component to system level, subsystem design, and implementation strategies. This information will help reduce the risk, shorten the development period, and lower the cost of hyperspectral satellite missions. This book is a must-have reference for professionals in developing hyperspectral satellites and data applications. It is also an excellent introductory book for early practitioners and students who want to learn more about hyperspectral satellites and their applications.

Agricultural Automation Qin Zhang 2016-04-19 Agricultural automation is the core technology for computer-aided agricultural production management and implementation. An integration of equipment, infotronics, and precision farming technologies, it creates viable solutions for challenges facing the food, fiber, feed, and fuel needs of the human race now and into the future. Agricultural Automat

Geospatial Technologies for Land and Water Resources Management Ashish Pandey 2021-12-06 This book focuses on the application of geospatial technologies to study the land use land cover (LULC) dynamics, agricultural water management, water resources assessment and modeling, and studies on natural disasters. LULC dynamics is one of the major research themes for

studying global environmental change using remote sensing data. The section on LULC dynamics covers the multi-variate criteria for land use and land cover classification and change assessment in the mountainous regions. Further, LULC change detection of the Tons river basin and LULC dynamics at decadal frequency are studied to derive adaptation and mitigation strategies. Landscape-level forest disturbance modeling, together with conservation implications, is also included. The watershed management approach is necessary for comprehensive management of land and water resources of any region, where studies on multi-criteria analysis for rainwater harvesting planning and its impact on land use land cover transformations in rain-fed areas using geospatial technologies are presented in this book. The book will be useful for academics, water practitioners, scientists, water managers, environmentalists, and administrators, NGOs, researchers, and students who are actively involved in the application of geospatial technologies in LULC studies, agricultural water management and hydrological modelling and natural disasters for addressing the challenges being posed by climate change while addressing issues of food and water securities

Fundamentals of Remote Sensing George Joseph 2005 This book presents the fundamental concepts covering various stages of remote sensing from data collection to end utilization, so that it can be appreciated irrespective of the discipline in which the reader has graduated. The physical principles on which remote sensing are based has been explained without getting into complicated mathematical equations.

Input Use Efficiency for Food and Environmental Security Rajan Bhatt 2022-01-11 Ending hunger, achieving food security and promoting sustainable development are at the top of the list of United Nations (UN) sustainable global development priorities. In the times of high population growth and increasing pressure of agricultural systems, efficiency in use of natural resources has

been at the epicenter of sustainable agricultural. The concept of 'Input efficiency' implies production of high quantity and quality of food, from using only finite natural resources as inputs, in the form of mainly land, water, nutrients, energy, or biological diversity. In this book, editors provide a roadmap to the food, nutritional, and environmental security in the agricultural systems. They share insight into the approaches that can be put in practice for increasing the input use efficiency in the cropping systems and achieve stability and sustainability of agricultural production systems. This book is of interest to teachers, researchers, climate change scientists, capacity builders and policymakers. Also the book serves as additional reading material for undergraduate and graduate students of agriculture, agroforestry, agroecology, and environmental sciences. National and international agricultural scientists, policymakers will also find this to be a useful read.

Agriculture in Africa Luc Christiaensen 2017-10-25 Stylized facts set agendas and shape debates. In rapidly changing and data scarce environments, they also risk being ill-informed, outdated and misleading. So, following higher food prices since the 2008 world food crisis, robust economic growth and rapid urbanization, and climatic change, is conventional wisdom about African agriculture and rural livelihoods still accurate? Or is it more akin to myth than fact? The essays in "Agriculture in Africa †" Telling Myths from Facts†? aim to set the record straight. They exploit newly gathered, nationally representative, geo-referenced information at the household and plot level, from six African countries. In these new Living Standard Measurement Study-Integrated Surveys on Agriculture, every aspect of farming and non-farming life is queried—from the plots farmers cultivate, the crops they grow, the harvest that is achieved, and the inputs they use, to all the other sources of income they rely on and the risks they face. Together the surveys cover more than 40 percent of the Sub-Saharan African population. In all, sixteen conventional

wisdoms are examined, relating to four themes: the extent of farmer's engagement in input, factor and product markets; the role of off-farm activities; the technology and farming systems used; and the risk environment farmers face. Some striking surprises, in true myth-busting fashion, emerge. And a number of new issues are also thrown up. The studies bring a more refined, empirically grounded understanding of the complex reality of African agriculture. They also confirm that investing in regular, nationally representative data collection yields high social returns.

Advances in Environmental Remote Sensing Qihao Weng 2011-02-16 Generating a satisfactory classification image from remote sensing data is not a straightforward task. Many factors contribute to this difficulty including the characteristics of a study area, availability of suitable remote sensing data, ancillary and ground reference data, proper use of variables and classification algorithms, and the analyst's e

Remote Sensing Handbook - Three Volume Set Prasad Thenkabail 2018-10-03 A volume in the three-volume Remote Sensing Handbook series, Remote Sensing of Water Resources, Disasters, and Urban Studies documents the scientific and methodological advances that have taken place during the last 50 years. The other two volumes in the series are Remotely Sensed Data Characterization, Classification, and Accuracies, and Land Reso

UAS-Remote Sensing Methods for Mapping, Monitoring and Modeling Crops Francisco Javier Mesas Carrascosa 2021-04-22 The advances in unmanned aerial vehicle (UAV) platforms and onboard sensors in the past few years have greatly increased our ability to monitor and map crops. The ability to register images at ultrahigh spatial resolution at any moment has made remote sensing techniques increasingly useful in crop management. These technologies have revolutionized the way in which remote sensing is applied in precision agriculture, allowing for decision-

making in a matter of days instead of weeks. However, it is still necessary to continue research to improve and maximize the potential of UAV remote sensing in agriculture. This Special Issue of Remote Sensing includes different applications of UAV remote sensing for crop management, covering RGB, multispectral, hyperspectral and light detection and ranging (LiDAR) sensor applications aboard UAVs. The papers reveal innovative techniques involving image analysis and cloud points. However, it should be emphasized that this Special Issue is a small sample of UAV applications in agriculture and that there is much more to investigate.

Tropical Agroforestry Alain Atangana 2013-10-29 Agroforestry is recognized as a sustainable land-use management in the tropics, as it provides environmental-friendly ecosystems; it also provides people with their every day need for food and cash. Since the recognition of agroforestry as a science, curricula have been developed for agroforestry programs for undergraduate and graduate trainings in Universities. Therefore, there is an urgent need to develop and make available educational material. This textbook strives to provide up-to-date information on tropical agroforestry to serve as educational material in the tropical context. The authoritative textbook of Nair (1993) on agroforestry was published 18 years ago, and before the advent of tree domestication, an important agroforestry practice today. In addition, many other research activities, such as carbon sequestration and integrated pest management, have been included in the agroforestry agenda. This textbook is intended for agroforestry students, teachers, and practitioners.

Data Science in Agriculture and Natural Resource Management G. P. Obi Reddy 2021-10-11 This book aims to address emerging challenges in the field of agriculture and natural resource management using the principles and applications of data science (DS). The book is organized in three sections, and it has fourteen chapters dealing with specialized areas. The chapters are written

by experts sharing their experiences very lucidly through case studies, suitable illustrations and tables. The contents have been designed to fulfil the needs of geospatial, data science, agricultural, natural resources and environmental sciences of traditional universities, agricultural universities, technological universities, research institutes and academic colleges worldwide. It will help the planners, policymakers and extension scientists in planning and sustainable management of agriculture and natural resources. The authors believe that with its uniqueness the book is one of the important efforts in the contemporary cyber-physical systems.

Hyperspectral Remote Sensing of Vegetation Prasad S. Thenkabail 2016-04-19 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.
Digital Remote Sensing Prithvish Nag 1998
Remote Sensing Application for Precision Agriculture Matthew McCabe 2023-08-11 Precision agriculture is used to improve site-specific agricultural decision-making based on data collection and analysis, formulation of site-specific management recommendations, and implementation of management practices to correct for factors that can limit crop growth, yield, and quality. Various approaches for the remote sensing of soil fertility, water stress, diseases and infestations, and crop growth and condition have been developed and applied for precision agricultural purposes. With developments in remote sensing technologies, the spatial and spectral resolution and return frequencies available from both satellite and other remote

collection platforms have improved to the point that the promise of precision agriculture can increasingly be realized. Unmanned aerial vehicles (UAV) in particular are providing newer and deeper insights, leveraging their high resolution, sensor-carrying flexibility and dynamic acquisition schedule. This range of remote sensing platforms has been used to estimate comprehensive information related to crop health and dynamics, providing rapid retrievals of leaf area index, canopy cover, chlorophyll, nitrogen, canopy/leaf water content, canopy/leaf temperature, biomass, and yield, amongst many other variables of interest. In combination, they allow for the expansion from local to regional scales and beyond. There has never been a greater opportunity for remote sensing data to enable precision agricultural insights that can be used to better monitor, manage and respond to in-field changes that might impact crop growth, health and yield.

Land Resources Monitoring, Modeling, and Mapping with Remote Sensing Ph.D., Prasad S. Thenkabail 2015-10-02 A volume in the three-volume Remote Sensing Handbook series, Land Resources Monitoring, Modeling, and Mapping with Remote Sensing documents the scientific and methodological advances that have taken place during the last 50 years. The other two volumes in the series are Remotely Sensed Data Characterization, Classification, and Accuracies, and Remo

Comprehensive Geographic Information Systems 2017-07-21 Geographical Information Systems, Three Volume Set is a computer system used to capture, store, analyze and display information related to positions on the Earth's surface. It has the ability to show multiple types of information on multiple geographical locations in a single map, enabling users to assess patterns and relationships between different information points, a crucial component for multiple aspects of modern life and industry. This 3-volumes reference provides an up-to date account of this growing discipline through in-depth reviews authored by leading experts in the field. VOLUME EDITORS Thomas J. Cova

The University of Utah, Salt Lake City, UT, United States Ming-Hsiang Tsou San Diego State University, San Diego, CA, United States Georg Bareth University of Cologne, Cologne, Germany Chunqiao Song University of California, Los Angeles, CA, United States Yan Song University of North Carolina at Chapel Hill, Chapel Hill, NC, United States Kai Cao National University of Singapore, Singapore Elisabete A. Silva University of Cambridge, Cambridge, United Kingdom Covers a rapidly expanding discipline, providing readers with a detailed overview of all aspects of geographic information systems, principles and applications Emphasizes the practical, socioeconomic applications of GIS Provides readers with a reliable, one-stop comprehensive guide, saving them time in searching for the information they need from different sources

Multitemporal Remote Sensing Yifang Ban 2016-12-01 Written by world renowned scientists, this book provides an excellent overview of a wide array of methods and techniques for the processing and analysis of multitemporal remotely sensed images. These methods and techniques include change detection, multitemporal data fusion, coarse-resolution time series processing, and interferometric SAR multitemporal processing, among others. A broad range of multitemporal datasets are used in their methodology demonstrations and application examples, including multispectral, hyperspectral, SAR and passive microwave data. This book features a variety of application examples covering both land and aquatic environments. Land applications include urban, agriculture, habitat disturbance, vegetation dynamics, soil moisture, land surface albedo, land surface temperature, glacier and disaster recovery. Aquatic applications include monitoring water quality, water surface areas and water fluctuation in wetland areas, spatial distribution patterns and temporal fluctuation trends of global land surface water, as well as evaluation of water quality in several coastal and marine environments. This book will help scientists, practitioners,

students gain a greater understanding of how multitemporal remote sensing could be effectively used to monitor our changing planet at local, regional, and global scales.

Recent Advances in Remote Sensing for Crop Growth Monitoring 2016 Recent Advances in Remote Sensing for Crop Growth Monitoring.

Stakeholder mapping and needs assessment - Lebanon Food and Agriculture Organization of the United Nations 2020-02-17 Given the scarcity of land and water resources, global strategies to increase food production should focus efforts on increasing production per unit resources, i.e. the combined increase of production per unit land surface (yield expressed in kg/ha) and the increase of production per unit water used (water productivity expressed in kg/m³). The FAO portal to monitor WAter Productivity through Open access of Remotely sensed derived data (WaPOR) uses satellite information to compute and map key variables related to water and agriculture, such as evapotranspiration, biomass production and water productivity. The provision of near real time information through such open access data portal enables a range of service-providers to assist farmers attain more reliable yields and to improve their livelihoods; irrigation operators have access to new information to assess the performance of systems and to identify where to focus investments to modernize the irrigation schemes; and government agencies will be able to use the information to monitor and promote the efficient use of natural resources. This report presents the work undertaken to identify key stakeholders in the agriculture and Information and Communication Technologies (ICT) sector and the capacity needs of farmers to improve water productivity in a sustainable manner, through two components; the first surveys the role and capacities of various stakeholders in the ICT and agriculture sector in Lebanon, and the second presents and analyzes the results of a survey into the capacity needs of farmers in relation to the use of ICT in

agriculture in the Bekaa valley.

Remote Sensing for Natural Resources Management & Monitoring Mahesh Gaur 2016-10-01 The book attempts to match user need to the level of technology required for management, planning and monitoring of natural resources. It provides clear guidance on the reliability, accuracy and cost of applications. Editors believe that this endeavour shall provide a valuable scientific basis to students and researchers to address the future challenges in natural resources monitoring and management. Accurate inventory, assessment and periodic monitoring of resources will enable the policy makers to keep an eye on optimal utilization of resources and development process to take timely interventions. We further hope this book will be a valuable reference and provide practical guidance for all who work towards the goal of the sustainable and judicious use of resources.

Geospatial Technologies in Land Resources Mapping, Monitoring and Management G. P. Obi Reddy 2018-09-11 This book offers an overview of geospatial technologies in land resources mapping, monitoring and management. It consists of four main sections: geospatial technologies - principles and applications; geospatial technologies in land resources mapping; geospatial technologies in land resources monitoring; and geospatial technologies in land resources management. Each part is divided into detailed chapters that include illustrations and tables. The authors, from leading institutes, such as the ICAR-NBSS&LUP, IIT-B, NRSC, ICRISAT, share their experiences and offer case studies to provide advanced insights into the field. It is a valuable resource for the scientific and the teaching community, extension scientists at research institutes and agricultural universities/colleges as well as those involved in planning and managing land resources for sustainable agriculture and livelihood security.

Learning Spatio-temporal Representations of Satellite Time

Series for Large-scale Crop Mapping Vivien Sainte Fare Garnot 2022 Understanding and monitoring the agricultural activity of a territory requires the production of accurate crop type maps. Such maps identify the boundaries of each agricultural parcel along with the cultivated crop type. This information is valuable for a variety of stakeholders and has applications ranging from food supply prediction to subsidy allocation and environmental monitoring. While earlier crop type maps required tedious in situ data collection, the advent of automated analysis of remote sensing data enabled large-scale mapping efforts. In this dissertation, we consider the problem of crop type mapping from multispectral satellite image time series. In most of the literature of the past decade, this problem is typically addressed with traditional machine learning models trained on hand-engineered descriptors. Meanwhile, in the Computer Vision (CV) and Natural Language Processing (NLP) literature, the ability to train deep learning models to learn representations from raw data provoked a paradigm shift leading to unprecedented levels of performance on a variety of problems. Similarly, the application of deep learning models to remote sensing data significantly improved the state-of-the-art for crop type mapping as well as other tasks.In this thesis, we hold that current state-of-the-art methods from CV and NLP ignore some of the crucial specificities of remote sensing data and should not be applied directly. Instead, we argue for the design of bespoke methods exploiting the specific spatial, spectral, and temporal structures of satellite time series. We successively characterise crop type mapping as parcel-based classification, semantic segmentation, and panoptic segmentation. For each of these tasks, we develop a novel deep learning architecture adapted to the task's peculiarities and inspired by recent advances in the deep learning literature. We show that our methods set a new state-of-the-art while being more efficient than competing approaches.Specifically, we introduce (i) the Pixel-Set Encoder, an efficient spatial parcel-

based encoder, (ii) the Temporal Attention Encoder (TAE), a self-attention temporal encoder, (iii) U-net with TAE, a variation of the TAE for segmentation problems, and (iv) Parcel-as-Point, a lightweight instance segmentation head designed for the panoptic segmentation of parcels.We also explore how these architectures can leverage multi-modal image time series combining optical and radar information through well-chosen fusion schemes. This approach improves the mapping performance as well as the robustness to cloud obstruction. Lastly, we focus on the hierarchical tree that encapsulates the semantic relationships between crop classes. We introduce a method to include such structure in the learning process. On crop classification as well as other classification problems, we show that our method reduces the rate of errors between semantically distant classes.Along with these methods, we introduce PASTIS, the first large-scale open-access dataset of multimodal satellite image time series with panoptic annotations of agricultural parcels. We hope that this dataset, along with the promising results presented in this dissertation, will encourage further research and help produce ever more accurate agricultural maps.

Remote Sensing Applications for Agriculture and Crop Modelling Piero Toscano 2020-02-13 Crop models and remote sensing techniques have been combined and applied in agriculture and crop estimation on local and regional scales, or worldwide, based on the simultaneous development of crop models and remote sensing. The literature shows that many new remote sensing sensors and valuable methods have been developed for the retrieval of canopy state variables and soil properties from remote sensing data for assimilating the retrieved variables into crop models. At the same time, remote sensing has been used in a staggering number of applications for agriculture. This book sets the context for remote sensing and modelling for agricultural systems as a mean to minimize the environmental impact, while increasing production and productivity. The eighteen papers

published in this Special Issue, although not representative of all the work carried out in the field of Remote Sensing for agriculture and crop modeling, provide insight into the diversity and the complexity of developments of RS applications in agriculture. Five thematic focuses have emerged from the published papers: yield estimation, land cover mapping, soil nutrient balance, time-specific management zone delineation and the use of UAV as agricultural aerial sprayers. All contributions exploited the use of remote sensing data from different platforms (UAV, Sentinel, Landsat, QuickBird, CBERS, MODIS, WorldView), their assimilation into crop models (DSSAT, AQUACROP, EPIC, DELPHI) or on the synergy of Remote Sensing and modeling, applied to cardamom, wheat, tomato, sorghum, rice, sugarcane and olive. The intended audience is researchers and postgraduate students, as well as those outside academia in policy and practice.
Geospatial Technologies for Crops and Soils Tarik Mitran 2020-10-24 The sustainable development of the agriculture sector is the only option to meet the demands of increased and economically viable production in a changing climate. This means there is a need to introduce the latest technologies to enhance production, and also help policymakers make decisions for the future. Geospatial technologies & tools, such as remote sensing, geographical information systems (GIS), global positioning systems (GPS), and mobile & web applications, provide unique capabilities to analyze multi-scale, multi-temporal datasets, and support decision-making in sustainable agriculture development and natural resources management. Further, the availability of reliable and timely geospatial information on natural resources and environmental conditions is essential for sustainable agricultural development and food security. Since remote sensing solutions are fast, non-destructive and have large spatial coverage, they can play a significant role in the identification, inventory, and mapping of land resources. Over the past four decades, remote sensing has proved to be a cost-effective and

powerful tool to assess crop and soil properties in varying spatial and temporal scales using both visual and digital techniques. Satellite remote sensing coupled with GIS & mobile-app based positional information has emerged as an efficient tool for optimizing input resources, and minimizing cost of production and risk of biotic/ abiotic factors nature to promote sustainable agriculture. This book comprehensively documents the applications of space-based technologies for crop and soil assessments for the sustainable development of agriculture.

Remote Sensing in Precision Agriculture Salim Lamine 2023-10-27 Remote Sensing in Precision Agriculture: Transforming Scientific Advancement into Innovation compiles the latest applications of remote sensing in agriculture using spaceborne, airborne and drones' geospatial data. The book presents case studies, new algorithms and the latest methods surrounding crop sown area estimation, determining crop health status, assessment of vegetation dynamics, crop diseases identification, crop yield estimation, soil properties, drone image analysis for crop damage assessment, and other issues in precision agriculture. This book is ideal for those seeking to explore and implement remote sensing in an effective and efficient manner with its compendium of scientifically and technologically sound information. Presents a well-integrated collection of chapters, with quality, consistency and continuity Provides the latest RS techniques in Precision Agriculture that are addressed by leading experts Includes detailed, yet geographically global case studies that can be easily understood, reproduced or implemented Covers geospatial data, with codes available through shared links

Agricultural Survey Methods Roberto Benedetti 2010-03-18 Due to the widespread use of surveys in agricultural resources estimation there is a broad and recognizable interest in methods and techniques to collect and process agricultural data. This book brings together the knowledge of academics and experts to

increase the dissemination of the latest developments in agricultural statistics. Conducting a census, setting up frames and registers and using administrative data for statistical purposes are covered and issues arising from sample design and estimation, use of remote sensing, management of data quality and dissemination and analysis of survey data are explored. Key features: Brings together high quality research on agricultural statistics from experts in this field. Provides a thorough and much needed overview of developments within agricultural statistics. Contains summaries for each chapter, providing a valuable reference framework for those new to the field. Based upon a selection of key methodological papers presented at the ICAS conference series, updated and expanded to address current issues. Covers traditional statistical methodologies including sampling and weighting. This book provides a much needed guide to conducting surveys of land use and to the latest developments in agricultural statistics. Statisticians interested in agricultural statistics, agricultural statisticians in national statistics offices and statisticians and researchers using survey methodology will benefit from this book.

Gis & Rs Based Fertilizer Suitability Mapping for Wheat,Ethiopia Tadesse Hunduma Banja 2014-02 Fertilizer suitability mapping is the way of determining nutrients demanded by specific crop type on the basis of soil sample testing results. It is a very important method for modern precision agriculture to increase fertilizer use efficiency and environmental friendliness. In order to make efficient fertilizer application for wheat at Lume Watershed, the book tried to map the plant macro nutrients, physical land suitability and diammonium phosphate (DAP) suitability for wheat. Starting from soil sample collection to final map, standard laboratory analysis methods plus GIS and remote sensing tools were used. Because both potassium and nitrogen showed non-significant variation within the watershed, fertilizer suitability map was only made for phosphorous variability. The

DAP requirement for wheat was determined as the deference of phosphorous critical level for wheat from initial phosphorus level in the soil. Finally by applying Krignig interpolation DAP suitability map was prepared for wheat. The DAP requirement map of the area reveals that about 51.38%, 20.25%, 18.40% and 8.43% need 50 to75 kg/ha, 75 to 100kg/ha, 25 to 50kg/ha and greater than 100kg/ha respectively.

Advances in Remote Sensing for Natural Resource Monitoring Prem C. Pandey 2021-02-01 Sustainable management of natural resources is an urgent need, given the changing climatic conditions of Earth systems. The ability to monitor natural resources precisely and accurately is increasingly important. New and advanced remote sensing tools and techniques are continually being developed to monitor and manage natural resources in an effective way. Remote sensing technology uses electromagnetic sensors to record, measure and monitor even small variations in natural resources. The addition of new remote sensing datasets, processing techniques and software makes remote sensing an exact and cost-effective tool and technology for natural resource monitoring and management. Advances in Remote Sensing for Natural Resources Monitoring provides a detailed overview of the potential applications of advanced satellite data in natural resource monitoring. The book determines how environmental and - ecological knowledge and satellite-based information can be effectively combined to address a wide array of current natural resource management needs. Each chapter covers different aspects of remote sensing approach to monitor the natural resources effectively, to provide a platform for decision and policy. This important work: Provides comprehensive coverage of advances and applications of remote sensing in natural resources monitoring Includes new and emerging approaches for resource monitoring with case studies Covers different aspects of forest, water, soil- land resources, and agriculture Provides exemplary illustration of themes such as

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