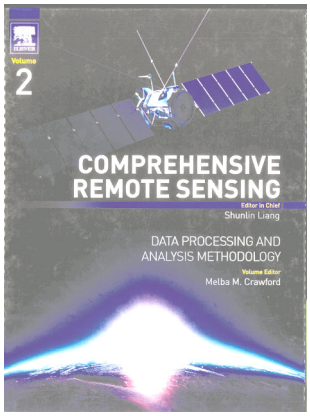

Comprehensive Remote Sensing, Volume 2: Data Processing and Analysis Methodology. Editor in Chief: Shunlin Liang. Volume Editor: Melba M. Crawford. Elsevier, Radarweg 29, P.O. Box 211. 1000 AE Amsterdam, Netherlands. 2018. xxii + 317 pages. Price: Not mentioned.

Currently, a large number of operational satellites are providing voluminous earth observation data, which demands a change in data processing and analysis methods. This book series is a timely release providing a compendium on the application of latest techniques such as machine learning methods for interpretation of remote sensing imagery. The volume under review discusses both conventional and advanced data processing techniques and different strategies for data interpretation available in the literature. This volume is also sandwiched between volume 1 on '*Missions and Sensors*', and the remaining eight volumes addressing a variety of important application domains extending to address societal benefits. It is thereby mandated to bridge the understanding among space-segment, ground segment, and application domains to bring continuity while highlighting gap areas.

Issues dealing with geometric calibration procedure for active (SAR, LiDAR) and passive sensors are dealt with sufficient lucidity. The geometric mapping of the SAR platform coordinates to a system of geolocation using ground targets and corner reflector arrays detected in the SAR data are discussed with a case study. An indirect approach of validating SAR images without the requirement of corner reflectors using a statistical model for co-registering the images with a master orthorectified image from Cosmo SkyMed mission is illustrated. The important concepts of boresight and the relation between the positioning of various sensors (LiDAR, IMU and GPS) are brought out along with the changes occurring at Von Gruber location points due to variations in different parameters in optical datasets using schematic illustrations. The dependency on external DEM for higher geometric fidelity in the case of interferometric SAR (InSAR) methods is detailed for the ground mapping and provided a viable solution. Quality control aspects for laser point density and laser point spacing are discussed with their importance and methods to evaluate. Perissin described the use of software like SARProz in a case study on InSAR with multi-baseline processing to overcome uncertainty due to atmospheric delay that affects the overall vertical accuracy of the SAR images.

The calibration details of high-resolution (HR) satellite sensors such as IRS-1C Panchromatic camera are discussed in detail. The studies were further extended to very high resolution (VHR) commercial satellites such as Worldview-2 and Pleiades. It also addressed the benefits of CMOS sensor technologies for direct readout of individual pixels over the traditional bucket-transfer based charge-coupled devices while highlighting issues of the signal-to-noise ratio with the CMOS. The use of GCPs, IMU, and direct geo-referencing (onboard) are well brought out. Importantly, it covers the latest aerial camera details (large and small format digital cameras) such as DMC (DMC-III has 375 megapixels), ultra cam, Leica ADS, and Wehrli sensors in terms of CCD/CMOS sizes and spatial resolutions. In all, the book provides the reader with information regarding, spaceborne and airborne optical sensor calibration and required photogrammetric concepts.

Advances in the utilization of hierarchical representation of objects are covered extensively with the latest advanced techniques reported in the literature on hierarchical representation using remote sensing data. The authors have dealt in great detail on the binary partition tree (BPT) with good schematic illustrations for various steps of the partition approach. This was followed by a discussion on these methods to hyperspectral, SAR images, and applications to image segmentation as well as classification to exploit multichannel information for target detection including urban feature extraction applications with good illustrations. The advanced feature extraction for earth observation data processing primarily reviews traditional linear and recent nonlinear methods of feature extraction specifically addressing discrimination of earth objects from high-resolution remote sensing data. It begins with conventional multivariate analysis method, and then introduces nonlinear methods as kernel feature extraction techniques, as an extension of linear methods, before taking up the most recent techniques based on artificial intelligence approaches to make the reader understand incrementally the development of research on this subject. The issues associated with nonparametric nonlinear methods are provided as an input for further research on this subject, with details of currently available source codes and their comparative performances. Excellent illustrations are given to support the merits of the methods discussed. Interestingly, advanced change indices are dealt with empirical, statistical as well as recent fuzzy and spatial-content methods with a summary table linking with publications dealing with these methods. This book describes the methods for exploiting long-term archived remote sensing data for crop phenology, land-cover monitoring, and pixel-based as well as context-based trend analysis for applications in monitoring crop conditions and snow cover evolution. The benefit of VHR imagery was briefed for hotspots identification in urban planning and building information systems.

The discussion on 'Data- and decision-level fusion' for classification begins with a description of the basic three levels of information fusion methodologies, and in particular for applications in multi-scale SAR imagery. In the subsequent section, the pixel-level fusion was expanded in detail for a multi-resolution analysis approach. Simultaneously, it covers a joint or stacked approach for multi-temporal classification, not generally included with remote sensing data fusion topics in many textbooks. Following this, the use of wavelet merging and the use of multi-scale Kalman filtering for SAR data fusion was explained in good detail. Under decision level merging, the text covers fusion with ensemble classifiers for a single scale and multi-scale approaches.

Pixel Unmixing by Du states the problem of deriving endmembers and their

abundance in a pixel and discusses its importance in hyperspectral image analysis with various algorithms. In the unsupervised case, the endmember estimation problem was well defined before introducing the search criteria. Supervised unmixing methods were described to derive abundance estimation with a linear mixing model. The importance of constrained unmixing has been brought out with an illustration of results from hyperspectral AVIRIS imagery. Recent advances in multiple spectral mixing and sparse regression models were described well with simulated spectral signatures.

The last three parts of the book deal with data assimilation and methodologies for integrating multiple high-level remotely sensed land variables as well as products. These highlight the benefits of integration of multiple high-level land surface products from various satellites capable of datasets with different spatial and temporal resolutions. Machine learning methods for calculations of vegetation cover variables are illustrated describing data assimilation framework in detail based on sequential and non-sequential methods for retrieval of land surface parameters with and without snow-covered surfaces. In particular, the dynamic model based on seasonal auto regression integrated moving average (ARIMA) model has been discussed in detail for developing the climatological data from multi-year MODIS LAI data and compared with field LAI values. The multi-resolution tree approach has been covered extensively for several land surface parameter retrieval including emissivity. A good treatment of combining low spatial resolution MODIS products with high-resolution Landsat after aggregation has been given with experimental illustrations. The merits of empirical orthogonal function-based integration are described with illustrations of filling data gaps of one satellite data with model-derived data. The authors have proposed in detail the Bayesian model averaging method for downward longwave radiation (DLR) and latent heat flux parameters and compared these with ground measured DLR data at 22 sites across the globe for assessing the accuracies of the estimation models. Similarly, for LAI products from five different models, ground measured data collected at 240-eddy covariance flux towers were used to evaluate their performance.

Machine learning and its variants with kernels, neural networks, manifold, ensemble learning, etc. including sufficient examples for each will attract the researchers. Of these, the kernel method has been dealt in considerable depth including more recent topics like sparse learning and active learning. An exhaustive introduction on neural networks and Markov Random field models is provided in the book. In ensemble decision making, the principles of boosting and bagging methods are very well explained with the help of flowcharts and explanations in detail. An interesting part of the discussion is the inclusion of a subsection after each technical description of methods on the applications of these in remote sensing fields with sufficient references on the current trend of research describing the applications of these methods in remote sensing.

Overall, this volume has covered a wide range of important topics from geometric processing and calibration of optical, LIDAR and SAR onboard sensors; advances in earth observation data analysis and feature extraction; machine learning and data assimilation and alike to address several aspects of data processing and analytical approaches in great detail. There are some overlapping topics across the chapters especially on multiresolution data analysis and fusion techniques; however, this is bound to happen with contributions from different authors. This book will find a place in the user community who is interested in gaining advanced knowledge involved in the processing of earth observation data to generate dependable geophysical and map products. This volume is a useful reading material for researchers from both academics, industries and decision-makers in administration.

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Annual Review of Phytopathology, 2019. Jan E. Leach and Steven E. Lindow (eds). Annual Reviews, 4139 El Camino Way, P.O. Box 10139, Palo Alto, California 94303-0139, USA. Vol. 57. xii + 529 pages. Price: US$ 116.00. ISSN: 0066-4286; ISBN: 978-0-8243-1357-9.

This volume with a collection of 23 articles representing important areas of plant pathology reviews not only the frontier fields but also racks up the traditional sub-disciplines bridging them with the genomics era. The lead article by Jeremy James Burdon, an eminent plant pathologist from CSIRO Agriculture and Food, Australia is a fascinating career biography written with an easy and absorbing style. His description demonstrates out-of-the-box approach that enabled him to move away in diverging directions involving a variety of aspects that has led to novel ideas and solutions associated with creativity. He has devoted his service in understanding the genetic basis of complexities in the role of pathogens in plant populations and in plant communities – deepening knowledge on co-evolution of plants and their pathogens, the conservation of plant genetic resources in addition to crop disease and weed management in agriculture. Burdon's contributions in plant pathology with a passion to be a field biologist emphasize 'the need for work in the field will never lessen' in the words of Webster (2005, cited in this chapter). Certainly, this essay reminds the Russian-born evolutionary biologist Theodosius Dobzhansky[1], who laid the foundation for the synthetic theory of evolution and, who advocated 'nothing in biology makes any sense except in the light of evolution' (Dobzhansky 1973, cited in this chapter) will lure the readers to this old science inextricably linked with the modern science and foster a desire to want to know more. Appropriate to this lead article, the editors have assembled a cascade of reviews which open up new opportunities fundamentally essential for burrowing deep into understanding plant health.

Understanding the pathogens and the diseases together with the pathogen lifestyle in their natural ecology in more detail would unravel fresh avenues for further investigations and possible applications for their management. The modern theory of metaorganism has its origin