Dr. Nitin Bhatia

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Research positions

Researcher at ARC CoE for coral reef studies, James Cook University, Townsville, Australia (2017— till date)

Analysis of time series remote sensing and in-situ data to quantify global land-cover/land-use change

Data processing researcher at Remote Sensing Unit (TAP), Flemish Institute for Technological Research (VITO), 2400 Mol, Belgium (January 2016—December 2016)

I was involved in the following two projects

Project 1: PV-LAC (ESA Project): Advanced Land, Aerosol and Coastal products for Proba-V, multispectral sensor. I focused on the specific component of this project where the objective was to study the feasibility of the use of PROBA-V data for coastal applications, more specifically for the monitoring of Total Suspended Matter/Turbidity (TSM/T).

Project 2: PROBA4COAST (BELSPO Project): Proba-V for total suspended matter and turbidity retrieval in coastal areas. I focused on to evaluate the feasibility of a Proba-V data for generating TSM/T product.

My task was to develop (LINK):

i. atmospherically corrected images after exploring and implement suitable atmospheric correction algorithm(s) for coastal waters,
ii. TSM/T products after exploring and implement suitable TSM/T algorithm(s) for coastal waters,
iii. uncertainty/sensitivity analysis of Proba-V reflectance and TSM/T products.

Work experience in modeling and software development

Engineer (Modeling), RMS India Pvt. Ltd (2010—2011),

Software Developer, World Fashion Exchange (I) Ltd, Gurgaon, India (2006—2008).

Academic qualification

Ph. D in remote sensing

Thesis title: Uncertainty Propagation of Atmospheric Correction Parameters (Link)

The main objective was to quantify the propagation of uncertainty in a layered processing system as applied in Processing and Archiving Facilities (PAF). A framework was presented that is suited for the purpose. Practical uncertainty estimates were then obtained in estimating a reflectance product using three parameters: column water vapour, aerosol optical depth, and the adjacency range. We demonstrated the propagation of uncertainty from the reflectance product to application products, by focusing on unmixing i.e. retrieving materials and their proportional abundances present in each pixel.

This Ph.D. was a collaboration between VITO and Department of Earth Observation Science, ITC, University of Twente, The Netherlands.

Promoters and co-promoters

Prof. Dr. (ir.) Alfred Stein (University of Twente), promoter,
Dr. Valentyn Tolpekin (University of Twente), co-promoter,
Dr. Ils Reusen (VITO), co-promoter.

M.Sc. 2008 — 2010 with Distinction

Thesis title: Hyperspectral Image Denoising: Interscale Orthonormal Wavelet Shrinkage Using Spatial-Spectral Domain **(**Link**)**
This research concentrates on developing a noise reduction method using orthonormal wavelet shrinkage to denoise hyperspectral imageries. This M.Sc. research was performed under the Joint Education Program between University of Twente, Netherlands and Indian Institute of Remote Sensing (IIRS), Indian Space Research Organization (ISRO), India.

Thesis advisors
Dr. Anil Kumar (IIRS)
Dr. V. A Tolpekin (University of Twente)
Dr. A. K Mishra (IIRS)

Engineering (B. Tech) in Information Technology from Indraprastha University, New Delhi (GGIPU), 2003 — 2006

Diploma in Electrical Engineering, 2000 — 2003 from Aryabhat Institute of Technology, New Delhi (2000—2003)

Publications

N. Bhatia, V. A. Tolpekin, I. Reusen, S. Sterckx, J. Biesemans, and A. Stein, “Sensitivity of reflectance to water vapour and aerosol optical thickness”, in IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, vol. 8, no. 6, pp. 3199–3208, 2015

Doi: 10.1109/JSTARS.2015.2425954

N. Bhatia, M. D. Iordache, A. Stein, I. Reusen, and V. A. Tolpekin, “Propagation of uncertainty in atmospheric parameters to hyperspectral unmixing”, in Remote Sensing of Environment, vol. 204, pp. 472–484, 2018

Doi: https://doi.org/10.1016/j.rse.2017.10.008

N. Bhatia, A. Stein, I. Reusen and V. A. Tolpekin, “An optimization approach to estimate and calibrate column water vapour for hyperspectral airborne data”, in International Journal of Remote Sensing, vol. 39, no. 8, pp. 2480–2505, 2018

Doi: https://doi.org/10.1080/01431161.2018.1425565

N. Bhatia, V. A. Tolpekin, A. Stein and I. Reusen, “Estimation of AOD under uncertainty: an approach for hyperspectral airborne data”, in Remote Sensing to special issue in uncertainty in remote sensing image analysis, vol. 10, no. 6, 2018

Doi: https://doi.org/10.3390/rs10060947

M. D. Iordache, N. Bhatia, J. M. Bioucas-Dias, A. Plaza “Uncertainty Propagation from Atmospheric Parameters to Sparse Hyperspectral Unmixing”, conference paper, IEEE GRSS 2016, session: Hyperspectral Data Processing and Analysis, July, 2016.

Doi: 10.1109/IGARSS.2016.7730602

E. Knaeps, S. Sterckx, N. Bhatia, Q. Bi, J. Monbaliu, E. Toorman, A. Cattrrijsse, L. Keukelaere, “Coastal turbidity monitoring sing the PROBA-V satellite”, in Coastal Dynamics, paper no. 019, pp. 1483–1494, 2017. (Link)

N. Bhatia, J. Biesemans, V.A. Tolpekin, I. Reusen, S. Sterckx, A. Stein, “Optimizing the range of atmospheric condition parameters to avoid over estimation of uncertainty”, IEEE Whispers conference 2014, 25-27 June 2014, Lausanne, Switzerland.

DOI: 10.1109/WHISPERS.2014.8077513

N. Bhatia, J. Biesemans, V.A. Tolpekin, I. Reusen, S. Sterckx, A. Stein, “Global sensitivity analysis of water vapor and visibility for atmospheric correction”, IEEE Whispers conference 2014, 25-27 June 2014, Lausanne, Switzerland.

DOI: 10.1109/WHISPERS.2014.8077515

Oral and Poster Presentations

Bhatia N., Tolpekin V.A, Biesemans J., Reusen I., Sterckx S., Stein A., “Exploration of the correlation structure of the atmospheric condition parameters in support of the design of uncertainty propagation methods for hyperspectral image processing workflows”, Poster presentation, EARSeL conference, Nantes, France 2013.

Bhatia N., Biesemans J., Tolpekin V.A., Reusen I., Sterckx S., Stein A. “Optimizing atmospheric condition parameters range to avoid over/under-estimation of uncertainty" Poster presentation in Whispers 2014, 25-27 June 2014, Lausanne, Switzerland.

Bhatia N., Biesemans J., Tolpekin V.A., Reusen I., Sterckx S., Stein A., “Global Sensitivity Analysis of Water vapour concentration and Visibility for Atmospheric correction” Oral presentation in Whispers 2014, 25-27 June 2014, Lausanne, Switzerland.

Bhatia N., Kumar A., Tolpekin V.A, “Hyperspectral image denoising inter scale orthonormal wavelet shrinkage”, selected for Oral presentation in Indian Society of Remote Sensing, ISRS National symposium -2009, Nagpur.

Honours

Funding from Flemish Institute for Technical Research (VITO) for Ph. D

Awarded distinction in M.Sc.

During the M.Sc. I was rewarded a scholarship by Indian Space Research Organization (ISRO). The M.Sc. work was utilized to remove strip-noise from images acquired by the Ocean Color Monitor (OCM) sensor. The scholarship was related to this project