

# SUDIPAN SAHA

*Post Doc*, International AI Future Lab, AI for Earth Observation (AI4EO)  
Technical University of Munich, Munich, Germany

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RESEARCH INTERESTS Applied Deep Learning, Image Processing, Remote Sensing, Deep Domain Adaptation. Multitemporal Satellite Image Processing, Urban Monitoring.

EDUCATION **University of Trento and Fondazione Bruno Kessler**, Trento, Italy

PhD, Information and Communication Technology, (Defended: May 29, 2020)

- Thesis: *Advanced deep learning based multi-temporal remote sensing image analysis*.
- Supervisor: Dr. Francesca Bovolo [Link](#)
- Co-supervisor: Prof. Lorenzo Bruzzone [Link](#)
- Received University PhD grant equivalent to 48870 Euro.

**Indian Institute of Technology Bombay**, Mumbai, India

Master of Technology, Electrical Engineering, 2014

- Thesis: *Ultrasound Image Processing for CAD and Other Applications*.
- Supervisor: Prof. Shabbir N. Merchant [Link](#)
- CPI: 9.33/10 [Transcript Link](#)
- [Thesis Link](#)                      [Presentation Link](#)

**Institute of Engineering & Management**, Kolkata, India

Bachelor of Technology, Electronics and Communication Engineering, 2011

- CGPA: 8.72/10 [Marksheets Link](#)

WORK EXPERIENCE

**Engineer in Computational Nanomask Technology Division, TSMC Limited, Taiwan**

March '15 to August '16

- Development of image processing algorithms, mainly for Scanning Electron Microscope image processing; which is critical in semiconductor industry.
- Development of algorithms for enhancing defect inspection tool's efficiency.

**Programming Analyst in**

**Citi (Citicorp Services India Limited, a division of Citibank)**

July '14 to Feb '15

- Associated in projects involving C# programming.

PUBLICATIONS

**Journal**

- "Unsupervised deep change vector analysis for multiple-change detection in VHR Images" in *IEEE Transactions on Geoscience and Remote Sensing*, 2019 ([Link](#), **First Author**).
- "Semisupervised change detection using Graph Convolutional Network" in *IEEE Geoscience and Remote Sensing Letters*, 2020 ([Link](#), **First Author**).
- "Unsupervised deep joint segmentation of multi-temporal high resolution images" in *IEEE Transactions on Geoscience and Remote Sensing*, 2020, ([Link](#), **First Author**).
- "Unsupervised deep transfer learning-based change detection for HR multispectral images" in *IEEE Geoscience and Remote Sensing Letters*, 2020, ([Link](#), **First Author**).
- "Building change detection in VHR SAR images via unsupervised deep transcoding" in *IEEE Transactions on Geoscience and Remote Sensing*, 2020, ([Link](#), **First Author**).

- “Change detection in image time-Series using unsupervised LSTM” in *IEEE Geoscience and Remote Sensing Letters*, 2020, ([Link](#), **First Author**).
- “Automatic landslide inventory mapping approach based on change detection technique with very-high-resolution images” in *IEEE Geoscience and Remote Sensing Letters*, 2020, ([Link](#)).

## Conferences

- “A novel approach to unsupervised segmentation of multitemporal VHR images based on deep learning” in *Proc. IEEE Geoscience and Remote Sensing Symposium*, 2020 (**First Author**).
- “An explainable convolutional autoencoder model for unsupervised change detection” in *Proc. XXIV ISPRS Congress*, 2020 ([Link](#)).
- “Unsupervised multiple-change detection in VHR multisensor images via deep-learning based adaptation” in *Proc. IEEE Geoscience and Remote Sensing Symposium*, 2019 ([Link](#), **First Author**).
- “Unsupervised deep learning based change detection in Sentinel-2 images” in *Proc. 10th International Workshop on the Analysis of Multitemporal Remote Sensing Images (MultiTemp)*, 2019 ([Link](#), **First Author**).
- “A high resolution burned area detector for Sentinel-2 and Landsat-8” in *Proc. 10th International Workshop on the Analysis of Multitemporal Remote Sensing Images (MultiTemp)*, 2019 ([Link](#)).
- “Unsupervised change-detection based on convolutional-autoencoder feature extraction” in *Proc. Image and Signal Processing for Remote Sensing XXV (SPIE Remote Sensing)*, 2019 ([Link](#)).
- “Single image super-resolution for optical satellite scenes using deep deconvolutional network” in *Proc. International Conference on Image Analysis and Processing (ICIAP)*, 2019 ([Link](#)).
- “Semantic guided deep unsupervised image segmentation” in *Proc. International Conference on Image Analysis and Processing (ICIAP)*, 2019 ([Link](#), **First Author**).
- “Destroyed-buildings detection from VHR SAR images using deep features ” in *Proc. Image and Signal Processing for Remote Sensing XXIV (SPIE Remote Sensing)*, 2018 ([Link](#), **First Author**).
- “Unsupervised multiple-change detection in VHR optical images using deep features” in *Proc. IEEE Geoscience and Remote Sensing Symposium*, 2018 ([Link](#), **First Author**).
- “Unsupervised domain adaptation without source domain training samples: a maximum margin clustering based approach” in *Proc. Indian Conference for Vision, Graphics & Image Proc.*, 2016 ([Link](#), **First Author**).
- “Image foreground extraction - a supervised framework based on region transfer” in *Proc. Int. Conf. on Signal & Information Proc.*, 2016 ([Link](#)).
- “Shallow versus deep features for classification of perceptually challenging B-mode ultrasound images” in *Proc. Int. Conf. on Signal & Information Proc.*, 2016. (**First Author**).
- “Estimation of the area of mouth opening during speech production” in *Proc. Indian Conference for Vision, Graphics & Image Proc.*, 2012 ([Link](#), **First Author**).
- “Estimation of lip opening for scaling of vocal tract area function for speech training aids” in *Proc. National Conference on Communication*, 2012 ([Link](#)).

## Book Chapter

- “Graph theoretic approaches for image analysis ” in *Intelligent Multidimensional Data Clustering and Analysis (Publisher: IGI Global)*, 2017 ([Link](#)).

## INVITED TALKS

- “Unsupervised deep learning for multi-temporal analysis” at AI4EO lab, Munich, Germany, available [here](#)
- “Unsupervised deep learning for bi-temporal High Resolution image analysis” at German Aerospace Center (DLR), Munich, Germany (June 2019).
- “Multitemporal image analysis using deep learning” at Fondazione Bruno Kessler, Trento, Italy (February 2019).

## EDITORIAL SERVICE

- Guest editor at MDPI remote sensing special issue “Advanced AI for Remote Sensing: Methodology and Application.” ([Link](#))

## REVIEW SERVICE ([Publons Link](#))

- IEEE Transactions on Geoscience and Remote Sensing
- IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing
- IEEE Geoscience and Remote Sensing Letters
- IEEE Transactions on Multimedia
- IEEE Transactions on Cybernetics
- ISPRS Journal of Photogrammetry
- SPIE Journal of Applied Remote Sensing
- SPIE Journal of Medical Imaging
- SPIE Optical Engineering
- MDPI Journal of Remote Sensing
- MDPI Atmosphere
- Springer Earth Science Informatics
- International Journal of Remote Sensing and Remote Sensing Letters
- 2016 IEEE Students’ Technology Symposium ([Link](#))

## TEACHING / MENTORING EXPERIENCE

### During PhD

- Mentored 1 student for Masters thesis, University of Trento (’18) - helped in formulating problem statement, selecting appropriate literature, designing methodologies, and writing thesis.
  - Luca Bergamasco (currently PhD student at UniTn, Italy).
- Mentored 3 students for Bachelor thesis, University of Trento (’17, ’18) - helped in formulating problem statement, selecting appropriate literature, designing methodologies, and writing thesis.
  - Firas Hanife ([Link](#))
  - Alex Bojeri ([Link](#))
  - Massimo Clementi
- Mentored 4 students for course projects, University of Trento (’17, ’18, ’19, ’20) - helped in formulating problem statement and designing methodologies.
  - Davide Passetto
  - Jacopo Slaghenauffi
  - Lucrezia Nicolussi Giacomaz
  - Sergio Povoli ([Link](#))

### During Masters

- Mentor, Institute Student Companion Program, IIT Bombay (’12-’13).  
Mentored 16 students, provided guidance in personal, social and academic matters. ([Certificate Link](#))
- Mentored 2 students for their M.Tech. Seminar, IIT Bombay (’14) - helped in formulating problem statement and selecting appropriate literature.
  - Sheetal Agarwal ([Link](#))

- Kapil Yadav ([Link](#))
- Mentored 2 visiting students at SPANN Laboratory, IIT Bombay ('14) - provided tutorial on basics of Image Processing using Matlab and helped in coding activities.
  - Sharanya Jyotishi ([Link](#))
  - Falguni Joshee ([Link](#))

RESEARCH PROJECT CONTRIBUTION

**Third party participant in a project on a high resolution burned area detection processor**

- Design of algorithm to track the spatio-temporal evolution of the burned area.
- Design of i/o system and database interface using PostgreSQL.

PROFESSIONAL MEMBERSHIPS

- Member, IEEE; IEEE Geoscience and Remote Sensing Society since 2017

CONFERENCE SERVICE

- Member of organizing team, Indicon 2013, organized by IEEE Bombay Section and IIT Bombay. ([Certificate Link](#))

RELEVANT COURSEWORK & CORRESPONDING GRADES

**PhD**

- |  |                                    |
|--|------------------------------------|
| 1. Advanced Pattern Recognition (9/10) | 3. Research Methodology (10/10)    |
| 2. Statistical Relational AI (9/10)    | 4. Mathematical Morphology (10/10) |

**Masters**

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|---|-----------------------------------|
| 1. Advanced Satellite Image Processing (9/10) | 5. Machine Learning (Audit)       |
| 2. Image Processing (9/10)                    | 6. Wavelets (8/10)                |
| 3. Computer Vision (Audit)                    | 7. Geospatial Technologies (9/10) |
| 4. Applied Linear Algebra (8/10)              | 8. Probabilistic Models (Audit)   |

TOOLS & PROGRAMMING LANGUAGES

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|---|--------------------------|
| 1. Matlab (Proficient)                            | 5. ENVI (Fair)           |
| 2. Python (Proficient)                            | 6. QGIS (Fair)           |
| 3. C# (Fair) ( <a href="#">Certificate Link</a> ) | 7. eCognition (Familiar) |
| 4. PyTorch (Proficient)                           |                          |

OTHER ACADEMIC ACHIEVEMENTS / AWARDS

- Best Poster Winner, Fondazione Bruno Kessler (Italy) PhD day ([News Link](#))
- Special Prize, Science & Engg. Fair 2010 organized by BITM, Ministry of Culture, Govt. of India. ([Certificate Link](#))
- 2nd Prize, FOSET Academic Meet 2010, West Bengal, India. ([Certificate Link](#))
- 3rd Prize, IIT Kharagpur Techfest Kshitij, 2010 Software Design Competition. ([Certificate Link](#))
- 1st Prize, Institute of Engineering & Management Techfest Festronix, 2009, Event - Embed. ([Certificate Link](#))
- 2nd Prize, Institute of Engineering & Management Techfest Festronix, 2009, Event - Innova. ([Certificate Link](#))
- 2nd Prize, Student Paper Presentation Competition, Avenir 2010. ([Certificate Link](#))

NON-ACADEMIC ACHIEVEMENTS

General Secretary, Hostel 14, IIT Bombay, India ('13-'14) ([Certificate Link](#))

- Led a council comprising of 24 members; awarded Institute PG Passing Out Color (**Certificate Link**) and Hostel Roll of Honour (**Certificate Link**)

#### LANGUAGES

1. English (Proficient, TOEFL iBT score 106/120 in 2015)
2. Bengali (Native)
3. Hindi (Native)
4. Italian (Fair)
5. Chinese (Preliminary)