Nirdesh Kumar Sharma

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Carrer Objective

My goal is to develop solutions that enhance societal resilience against natural hazards. I use a combination of artificial intelligence, satellite imagery and physics based models to ascertain the drivers of natural hazards and devise preventive measures.

Research Interests

Natural Hazards, **Deep Learning and Computer Vision**, **Land Surface Modelling**, **Optical and SAR remote sensing**, **Geographic Information Systems** , **Parallel processing and Automation**

Education

- **Indian Institute of Technology - Delhi** — Delhi, India
  Research Scholar Department of Civil Engineering ; CGPA: 8.75/10 — *Sep. 2020 –*
  - **Theses**: Investigating rainfall triggered landslides using land surface models and machine learning
  - **SERB OVDF scholarship at University of Alberta**: Sep. 2023 - Sept 2024
- **Indian Institute of Technology - Guwahati** — Guwahati, India
  Master of Technology in Civil Engineering; CGPA: 9.62/10 — *Aug. 2018 – Jun. 2020*
  - **Theses**: Soil moisture inversion from SAR data using machine learning
  - **DAAD-KOSPIE scholarship at TU Darmstadt**: Sep. 2019 - Apr. 2020
- **National Institute of Technology- Hamirpur** — Hamirpur(H.P), India
  Bachelor of Technology in Civil Engineering; CGPA: 8.33/10 — *Aug. 2014 – May. 2018*
- **Class XII** — Palampur(H.P), India
  Central Board of Secondary Education; Grade 89.6/100 — *Mar. 2014*
- **Class X** — Baijnath(H.P), India
  Council For The Indian School Certificate Examinations; Grade: 95.2/100 — *Mar. 2012*

Awards

Funding Agency	Year	Description
SERB OVDF	2023-2024	Overseas Visiting Doctoral Fellowship at University of Alberta
Ministry of Human Resources	2020-2025	Institute scholarship for doctoral study at IIT-Delhi
DAAD-KOSPIE	2019-2020	Fellowship for research at TU Darmstadt
IIT-Delhi	2023	Overseas Travel Grant(RSTA) for visit to EGU 2023
Ministry of Human Resources	2018-2020	Institute scholarship for masters study at IIT- Guwahati
Government of Himachal Pradesh	2018	One time grant for Higher studies
Associated Cements	2014-2018	Excellence scholarship for undergraduate students at NIT Hamirpur

Projects

- **ML-CASCADE Machine Learning and Cloud Computing based landslide Detection using Earth Observation.**: Used machine learning algorithms on optical satellite data to identify the location and extent of historical landslides. The product is developed an easy to use Google Earth Engine App to leverage cloud computing infrastructure. WebTool
- **DeepSARFLOOD**: DeepSARFLOOD is a state-of-the-art automated flood segmentation framework based on ensemble deep learning and data fusion techniques and uses Sentinel 1 SAR data. The study also introduces a novel gain algorithm based on the diversity of model outputs to identify models for ensemble generation. Additionally, the framework also provides uncertainty estimates through pixel-wise probability from the ensemble models. Github

- **ILCD-India Landslide Change Detection Dataset for deep learning applications in landslide detection**: ILCD contains more than 200 landslides mapped from sentinel 2 images using a semi-automated framework ML-CASCADE. To develop a fully automated landslide identification model we develop and compare multiple AI-based frameworks like ensembles(Random Forests), deep learning segmentation (SegNet, UNet), and change detection (TINY-CD). Since the ILCD images are of different shapes, for deep learning we developed a patching framework that can process images of any size for training and deployment
- **India Landslide Susceptibility Map (ILSM)**: ILSM is India's first landslide susceptibility map prepared at 100m resolution using an ensemble of multiple machine learning models. The models are fitted over a carefully curated national database of landslide observations and a multitude of geophysical and climatological variables Github
- **Assimilating SMOPS data in NOAH M.P. for generating accurate high resolution soil moisture data products over India**: Combined the NOAH M.P. soil moisture with satellite based soil moisture SMOPs-ASCAT using ensemble Kalman filter to develop accurate soil moisture estimates.The estimates are compared against other remote sensing soil moisture datasets using ground data and are found to be more accurate Article

Work Experience

- **Teaching Assistant- IIT Delhi** Sep. 2020 - Present
  Teaching Assistant for Data-Driven Methods, Numerical Methods and Engineering Hydrology
- **Teaching Assistant- IIT Guwahati** Aug. 2018 - July. 2019
  Teaching Assistant for Remote Sensing, and Natural Hazards
- **Larsen and Toubro Limited- INSPIRE Internship** Jun. 2017-Aug. 2017
  Rework reduction and productivity enhancement of large building project
- **International Institute of Information Technology Hyderabad** Dec. 2016-Jan. 2017
  Evapotranspiration analysis of Krishna river basin using Thornthwaite model
- **Beas Valley Power Corporation- Government of Himachal Pradesh** Jun.2015-Aug 2015
  Social, Economical and Ecological impacts of a Hydroelectric powerplant in Beas valley

Memberships

- **Land Aware**: Life member
- **American Geophysical Union Student Member**: Jan 2021- Dec 2023
- **European Geophysical Union Student Member**: Jan 2022- Dec 2023

Skills

- **Languages**: Python, Google Earth Engine API, MATLAB **Softwares**: SNAP, ArcGIS, NASA-LISF, Q-GIS
- **Productivity**: MS Word, MS Powerpoint, MS Excel **Computation**: High Performance Computing

Certifications

Introduction to Python, Radar Remote Sensing, Python Programming,Matlab fundamentals, Matlab Programming

Extracurricular

- **Member NSS (2014-2018)**: Coordinated field visits for various social welfare schemes
- **Organizer IRCSTC (2015)**: Organized a workshop on climate extremes at NIT Hamirpur in collaboration with NEU Boston
- **Training Placement Representative (2017-2018)**: Coordinated with over 20 companies as member of placement team

Journal Publications

- **Nirdesh Sharma, Manabendra Saharia, G.V Ramana** : Development of an India Landslide Susceptibility Map (ILSM) using Ensemble Machine Learning (Manuscript under Review at Catena) GitHub
- **Nirdesh Sharma,Manabendra Saharia,Hetal P.**: DeepSARFlood: Operational SAR-based Flood Mapping using Ensemble Deep Learning and a Novel Ensemble Model Selection Algorithm (Manuscript under review at ISPRS Journal of Photogrammetry and Remote Sensing) GitHub
- **Nirdesh Sharma, Manabendra Saharia**: ML-CASCADE Machine Learning and Cloud Computing based landslide Detection using Earth Observation (Manuscript under Review Environmental Modelling and Software) Web App

Conference Publications

- **Sharma, N. and Saharia, M.**: DL-AISLE: A Deep Learning framework using Active Learning on Satellite imagery for Landslide identification, EGU General Assembly 2023, Vienna, Austria, 24–28 Apr 2023, EGU23-7155, https://doi.org/10.5194/egusphere-egu23-7155, 2023 Article
- **Sharma, N., Saharia,M.**: Identifying landslides from open-source satellite imagery using cloud computing ISRS-ISG symposium 2022
- **Sharma, N., Saharia, M., Singh, R., 2021** : Toward High-Resolution Soil Moisture Monitoring over India by Combining Remote Sensing Products with Land Surface Models 2021, H55D-0780. Article
- **Sharma, N., Singh, A., P, A., Saharia, M., C T, D., 2021**: Flood Exposure and Social Vulnerability during 2020 Assam Floods (other). Hydrology. https://doi.org/10.1002/essoar.10509510.1 GitHub Article
- **Pandey, R., Sharma, N.K., Saharia, M.**: LoRa-Based Communication System for Monitoring Water Quality of Lakes and Reservoirs, in: 2023 International Conference on Machine Intelligence for GeoAnalytics and Remote Sensing (MIGARS) https://doi.org/10.1109/MIGARS57353.2023.10064590 Article
- **N Sharma**: Using TROPOMI to map change in NO2 over India in covid-19. https://doi.org/10.5281/zenodo.4569495 GitHub Article