ABHILASH SINGH

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Senior Research Fellow, Indian Institute of Science Education and Research Bhopal, India
[Personal Website: https://www.abhilashsingh.net][Scopus][WoS] [Google Scholar][GitHub]

EDUCATION

Ph.D. (CGPA: 9.5/10) ***Aug 2018 - Present***
Fluvial Geomorphology and Remote Sensing Lab,
Department of Earth and Environmental Sciences,
Indian Institute of Science Education and Research Bhopal, India

Research Area: Applied machine learning, Deep learning, Nature-inspired algorithms, Soil moisture, Surface roughness, Disease prediction, River discharge, drainage congestion, waterlogging
Tentative thesis title: "Machine learning for soil moisture modelling and its application in drainage congestion and watterlogging."
Advisor: Dr. Kumar Gaurav

Integrated M.Tech. [5 Year Dual Degree] (CGPA: 9.41/10) ***Aug 2012 - July 2017***
School of Information and Communication Technology,
Department of Electronics and Communication Engineering,
Gautam Buddha University (State Govt.), Greater Noida, India

M.Tech in Wireless Communication and Networks.
Thesis: "Intelligent algorithm approach towards optimal coverage in wireless sensor networks."
Advisor: Dr. Sandeep Sharma

B.Tech. in Electronic and Communication Engineering.
Project 1 title: "Modelling and analysis of polarization noise in vertical cavity surface emitting LASERs."
Project 2 title: "Development of online examination portal for the university."
Advisor: Dr. Sandeep Sharma

Higher Secondary Examination (10+2) in Science (Percentage: 81%) ***May 2012***
Kendriya Vidyalaya No. 2, Ichapur, West Bengal, India.

Secondary Examination (10^{th}) (CGPA: 9.0/10) ***May 2010***
Kendriya Vidyalaya No. 2, Ichapur, West Bengal, India.

EXPERIENCE

Indian Institute of Science Education and Research Bhopal August 2019 - July 2022
Teaching Assistant *Bhopal, India*

- Subject: Data Analysis and Statistics (using MATLAB™/Python) (Fall 2019)
- Subject: Remote Sensing & GIS and Remote Sensing & GIS Laboratory (Spring 2020, 2021, 2022)
- Subject: Geo-hydrology (Fall 2020, 2021)

Indian Institute of Science Education and Research Bhopal March 2018 - March 2021
Junior/Senior Research Fellow *Bhopal, India*

- Worked on NISAR (NASA-ISRO Synthetic Aperture Radar) project funded by Space Application Center (SAC), ISRO.

Defence Research and Development Organisation (DRDO) June 2015 - July 2015
Summer Research Intern *Dehradun, India*

- Worked on "Design and simulation of elementary SRAM and its controller using Verilog on Model Sim"
- Advisor: Mr. Asheesh Thapliyal, Scientist D.

PUBLICATIONS [†]

Journal Articles

J33. Bhadani, V.[†], **Singh, A.**[†]., Kumar, V., and Gaurav, K. (2023). "F-IWO-GWL: Fuzzy based invasive weed optimization algorithm for groundwater level prediction," (Under review)

J32. Kumar A., Gaurav, K., **Singh, A.**, Yaseen Z. M. (2023). "Development of ensemble models to estimate streamflow in a semi-arid catchment," (Under review).

J31. Naik, M.N., Gaurav, K., **Singh, A.**., and Singh, A. K. (2023). "Dynamics of waterlogging and drainage congestion on the Kosi Fan, Himalayan Foreland," (Under revision)

J30. **Singh, A.**, Seyed, M. H., and Gaurav, K. (2023). "SHS: Scorpion Hunting Strategy Swarm Algorithm," (Revision submitted)

J29. **Singh, A.**, Patel, S.[†], Bhadani, V.[†], Kumar, V., and Gaurav, K. (2023). "AutoML-GWL: Automated machine learning model for the prediction of groundwater level," (Revision submitted)

J28. **Singh, A.**, Patel, S., and Gaurav, K. (2023). "PIML-SM: Physics-informed machine learning to estimate surface soil moisture from Sentinel-1/2 images by leveraging swarm intelligence," (Revision submitted)

J27. **Singh, A.**, Seyed, M. H., and Nagar, J. (2023). "F-TLBO-ID: Fuzzy Fed Teaching Learning Based Optimization Algorithm to Predict the Number of k-barriers for Intrusion Detection," (Revision submitted)

J26. Egwuche O. S., **Singh, A.**., Ezugwu A. E., Greeff, J., Olusanya, M.O., and Abualigah, L. (2023). "Machine Learning for Coverage Optimization in Wireless Sensor Networks: A Comprehensive Review of State-of-the-Art Approaches," **Annals of Operations Research** (Accepted)

J25. **Singh, A.**, Nagar, J., Amutha, J., and Sharma, S. (2023). "P^{2}CA-GAM-ID: Coupling of Probabilistic Principal Components Analysis with Generalised Additive Model to predict the k-barriers for Intrusion detection," **Engineering Applications of Artificial Intelligence**, Vol. 126, Part D, 107137. DOI: 10.1016/j.engappai.2023.107137 [PDF][CODE]

J24. Nagar, J., Chaturvedi S.K., Soh S., and **Singh, A.** (2023). "A Machine Learning Approach to Predict the k-Coverage Probability of Wireless Multihop Networks Considering Boundary and Shadowing Effects," **Expert Systems with Applications**, Vol. 226, 120160. DOI: 10.1016/j.eswa.2023.120160 [PDF][CODE]

J23. **Singh, A.**, Gaurav, K., Sonkar G.K., and Lee, C.-C. (2023). "Strategies to measure soil moisture using traditional methods, automated sensors, remote sensing, and machine learning techniques: review, bibliometric analysis, applications, research findings, and future directions ," **IEEE Access**, DOI: 10.1109/ACCESS.2023.3243635 [PDF]

J22. **Singh, A.**, and Gaurav, K. (2023). "Deep learning and data fusion to estimate surface soil moisture from multi-sensor satellite images," **Scientific Reports**, Vol. 13, 2251. DOI: 10.1038/s41598-023-28939-9 [PDF]

J21. **Singh, A.**, Mehra, M., Kumar A., Naik, M.N., Priya, D., and Gaurav, K. (2023). "Leveraging machine learning and data fusion for accurate mapping of malaria cases using meteorological variables over western India," **Intelligent Systems with Applications**, Vol. 17, 200164. DOI: 10.1016/ j.iswa.2022.200164 [PDF]

[†]Equal contribution; underlined names indicate the corresponding author(s)

J20. **Singh, A.**, Amutha, J., Nagar, J., and Sharma, S. (2023). "A deep learning approach to predict the number of k-barriers for intrusion detection over a circular region using wireless sensor networks," **Expert Systems with Applications**, Vol. 211, 118588. DOI: 10.1016/j.eswa.2022.118588 [PDF] [Data on Kaggle][CODE]

J19. Naik, M.N., Kumar, A., Beg, Z., **Singh, A.**, Swarnkar, S., and Gaurav, K. (2022). "Groundwater variability in a semi-arid basin, Central India, **Hydrology**, Vol. 9, issue 12, 222. DOI: 10.3390/hydrology9120222 [PDF]

J18. **Singh, A.**, Niranjannaik M., Kumar, S., and Gaurav, K. (2022). "Comparison of different dielectric models to estimate penetration depth of L− and S−band SAR signals into the ground surface," **Geographies**, Vol. 2, issue 4, pp. 734–742. DOI: 10.3390/geographies2040045 [PDF] [CODE] **(Invited contribution)**

J17. **Singh, A.**, Niranjannaik M., and Gaurav, K. (2022). "Drainage congestion due to road network on the Kosi alluvial Fan, Himalayan Foreland," **International Journal of Applied Earth Observation and Geoinformation**, Vol. 112, 102892. DOI:10.1016/j.jag.2022.102892 [PDF]

J16. **Singh, A.**, Amutha, J., Nagar, J., Sharma, S., and Lee, C.-C. (2022). "AutoML-ID: Automated machine learning model for intrusion detection using wireless sensor network," **Scientific Report**, Vol. 12, 9074. DOI:10.1038/s41598-022-13061-z [PDF]

J15. Sood T., Prakash S., Sharma, S., **Singh A.**, and Choubey H. (2022). "Intrusion Detection System in Wireless Sensor Network using Conditional Generative Adversarial Network," **Wireless Personal Communications**, Vol. 126, pp. 911-931. DOI:10.1007/s11277-022-09776-x [PDF]

J14. Kumar, A., **Singh, A.**, and Gaurav, K. (2022). "Assessing the synergic effect of land use and climate change on the upper Betwa River catchment in Central India under present, past, and future climate scenarios," **Environment, Development and Sustainability**. DOI:10.1007/s10668-022-02260-3 [PDF]

J13. **Singh, A.**, Amutha, J., Nagar, J., Sharma, S., and Lee, C.-C. (2022). "LT-FS-ID: Log-transformed feature learning and feature-scaling based machine learning algorithms to predict the k-barriers for intrusion detection using wireless sensor network," **Sensors**, Vol. 22, issue 3, pp. 1070. DOI: 10.3390/s22031070 [PDF][Data on UCI]

J12. Beg, Z., Gaurav, K., **Singh, A.**, and Tandon, S.K. (2022). "Assessing the palaeohydrology of the lost Saraswati River in the Punjab-Haryana plains, Northwest India from satellite data," **Palaeogeography, Palaeoclimatology, Palaeoecology**, Vol. 585, 110716. DOI: 10.1016/j.palaeo.2021.110716 [PDF]

J11. **Singh, A.**, Gaurav, K., Rai, A. K., and Beg, Z. (2021). "Machine learning to estimate surface roughness from the satellite images," **Remote Sensing**, Vol. 13, issue 19, pp. 3794. DOI: 10.3390/rs13193794 [PDF]

J10. Rai, A. K., Beg, Z., **Singh, A.**, and Gaurav, K. (2021). "Estimating discharge of the Ganga River from satellite altimeter data," **Journal of Hydrology**, Vol. 603 (Part A), 126860. DOI:10.1016/j.jhydrol.2021.126860 [PDF]

J9. Kotiyal, V.†, **Singh, A.**†, Sharma, S.†, Nagar, J.†, and and Lee, C.-C.† (2021). "ECS-NL: An Enhanced Cuckoo Search Algorithm for Node Localisation in Wireless Sensor Networks," **Sensors**, Vol. 21, issue 11, pp. 3576. DOI: 10.3390/s21113576 [PDF] [CODE]

J8. Singh, J., Chaturvedi, A., Sharma, S., and **Singh, A.** (2021). "A Novel Model to Eliminate the Doubly Near-Far Problem in Wireless Powered Communication Network," **IET Communication**, Vol. 15, issue 12, pp. 1539-1547. DOI: 10.1049/cmu2.12167 [PDF]

J7. **Singh, A.**, Nagar, J., Sharma, S., and Kotiyal, V. (2021). "A Gaussian Process Regression Approach

to Predict the k-barrier Coverage Probability for Intrusion Detection in Wireless Sensor Networks," **Expert Systems with Applications**, Vol. 172, 114603. DOI: 10.1016/j.eswa.2021.114603 [PDF] [CODE]

J6. **Singh, A.**, Sharma, S., and Singh, J. (2021). "Nature-Inspired Algorithms for Wireless Sensor Networks: A Comprehensive Survey," **Computer Science Review**, Vol. 39, 100342. DOI: 10.1016/j.cosrev.2020.100342 [PDF]

J5. **Singh, A.**, Kotiyal, V., Sharma, S., Nagar, J., and Lee, C.-C. (2020). "A Machine Learning Approach to Predict the Average Localisation Error with Applications to Wireless Sensor Networks," **IEEE Access**, Vol. 8, pp. 208253 - 208263, IEEE. DOI: 10.1109/ACCESS.2020.3038645 [PDF][Data on UCI] [CODE]

J4. **Singh, A.**, Gaurav, K., Meena, G. K., and Kumar, S. (2020). "Estimation of soil moisture applying modified Dubois model to Sentinel-1; A regional study from Central India," **Remote Sensing**, Vol. 12, issue 14, pp. 2266. DOI: 10.3390/rs12142266 [PDF] [CODE]

J3. Sharma, S., Kumar R., **Singh, A.**, and Singh, J. (2020). "Wireless information and power transfer using single and multiple path relays," **International Journal of Communication Systems**, Vol. 33, issue 14, e4464. DOI: 10.1002/dac.4464 [PDF]

J2. **Singh, A.**, Sharma, S., Singh, J., and Kumar, R. (2019). "Mathematical modelling for reducing the sensing of redundant information in WSNs based on biological inspired techniques," **Journal of Intelligent and Fuzzy Systems**, Vol. 37, issue 5, pp. 6829–6839.
DOI: 10.3233/JIFS-190605 [PDF]

J1. **Singh, A.**, Sharma, M., Kumar, R., Singh, S. P., and Madhesiya, J. R. (2019). "Modelling and analysis of polarization noise in vertical cavity surface emitting lasers," **Multiscale and Multidisciplinary Modeling, Experiments and Design**, Vol. 2, issue 3, pp. 151-157.
DOI: 10.1007/s41939-018-0033-9 [PDF] [CODE]

Conference Proceedings

C4. **Singh, A.**, Meena, G. K., Kumar, S., and Gaurav, K. (2019). "Evaluation of the penetration depth of L-and S-band (NISAR mission) microwave SAR signals into ground," In URSI AP-RASC 2019, **Radio Science**, IEEE. DOI:10.23919/URSIAP-RASC.2019.8738217 [PDF] [PPT] [CODE]

C3. **Singh, A.**, Meena, G. K., Kumar, S., and Gaurav, K. (2018). "Analysis of the effect of incidence angle and moisture content on the penetration depth of L- and S-band SAR signals into the ground surface," **ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences**, Vol. IV-5, pp. 197-202. DOI:10.5194/isprs-annals-IV-5-197-2018 [PDF] [VIDEO] [CODE]

C2. Kumar, R., and **Singh, A.** (2018). "Throughput optimization for wireless information and power transfer in communication network," In Signal Processing and Communication Engineering Systems (**SPACES**), 2018 conference (pp. 15), IEEE. DOI:10.1109/SPACES.2018.8316303 [PDF]

C1. Sharma, S., Singh, J., Kumar, R., and **Singh, A.** (2017). "Throughput-save ratio optimization in wireless powered communication systems," In Information, communication, instrumentation and control international conference (**ICIC**), pp. 16, IEEE. DOI:10.1109/ICOMICON.2017.8279031 [PDF]

Abstracts

A13. **Singh, A.**, Patel, S., Bhadani, V., Kumar, V., and Gaurav, K. (2023). "Revolutionizing Groundwater Level Prediction with Automated Machine Learning Models," American Geophysical Union (AGU), 2023, San Francisco, California, USA.

A12. **Singh, A.**, and Gaurav, K. (2023). "A physics-informed machine learning approach to estimate surface soil moisture," European Geosciences Union (EGU) General Assembly 2023, Vienna, Austria.

[PDF]

A11. Bhadani V., **Singh, A.**, Kumar V., and Gaurav, K. (2023). "Machine learning models to predict groundwater level in a Semi-arid river catchment, Central India," European Geosciences Union (EGU) General Assembly 2023, Vienna, Austria. [PDF]

A10. Niranjanaik M., Singh A.K, **Singh, A.**, and Gaurav, K. (2023). "Waterlogging and Drainage Congestion in the Kosi Fan of theHimalayan Foreland," European Geosciences Union (EGU) General Assembly 2023, Vienna, Austria. [PDF]

A9. **Singh, A.**, and Gaurav, K. (2022). "A physics-informed machine learning approach to estimate surface soil moisture," American Geophysical Union (AGU), 2022, Chicago, USA.

A8. **Singh, A.**, Mehra, M., Kumar A., Naik, M.N., Priya, D., and Gaurav, K. (2022). "Predicting malaria cases using a hybrid machine learning algorithm based on swarm intelligence," American Geophysical Union (AGU), 2022, Chicago, USA.

A7. Kumar, A., **Singh, A.**, Gaurav, K. (2022). "Evaluating the Performance of Multi-model Machine Learning Approach to Predict the Daily River Discharge," Asia Oceania Geosciences Society (AOGS), 2022, Singapore.

A6. **Singh, A.**, Niranjannaik, M., and Gaurav, K. (2022). "Assessing the spatial variability of soil moisture in the proximity of road networks on a large alluvial fan in the Himalayan Foreland," European Geosciences Union (EGU) General Assembly 2022, Vienna, Austria. [PDF] [VIDEO]

A5. **Singh, A.**, Gaurav, K., Beg, Z., and Rai A.K. (2021). "Machine learning and data fusion to estimate soil moisture from remote sensing data," American Geophysical Union (AGU), 2021, New Orleans, Louisiana, USA. [PDF]

A4. **Singh, A.**, Mehra, M., Kumar A., Niranjannaik, M., Priya, D., and Gaurav, K. (2021). "Accurate mapping of malaria cases using data fusion of meteorological variables: a deep learning approach," American Geophysical Union (AGU), 2021, New Orleans, Louisiana, USA. [PDF]

A3. Kumar, A., **Singh, A.**, and Gaurav, K. (2021). "Deep learning to predict river flow; a semi-arid catchment in the Central India," American Geophysical Union (AGU), 2021, New Orleans, Louisiana, USA. [PDF]

A2. **Singh, A.**, and Gaurav, K. (2021). "Machine learning to estimate surface roughness from satellite images," European Geosciences Union (EGU) General Assembly 2021, Vienna, Austria. DOI: https://doi.org/10.5194/egusphere-egu21-14183 [PDF] [VIDEO]

A1. **Singh, A.**, Gaurav, K., and Kumar, S. (2020). "Evaluating the potential of Sentinel-1 images for the estimation of soil moisture on an alluvial Fan," European Geosciences Union (EGU) General Assembly 2020, Vienna, Austria. DOI: https://doi.org/10.5194/egusphere-egu2020-19614 [PDF]

AWARDS, ACHIEVEMENTS, HONORS, AND GRANTS

- **GOLD MEDALIST**
  - Throughout first rank holder in B.Tech. and M.Tech.
- **DST INSPIRE FELLOWSHIP**
  - Selected for the prestigious DST INSPIRE FELLOWSHIP in "Engineering Sciences." Awarded by the Department of Science and Technology (DST), Govt. of India.
- **NATIONAL LEVEL EXAMS QUALIFIED**
  - **GATE** 2017
  - **UGC NET** 2016, 2017, and 2018.

- **RANK IN MATLAB™ CENTRAL (Coding and repository)**
  - Rank 1,534 out of 125,626 **(in Top 2%)** in MATLAB™ Cody in MathWorks. (Click)
  - Rank 1,090 out of 18,573 in MATLAB™ File Exchange in MathWorks. (over **14k** downloads) (Click)
- **GRANTS**
  - **2023: Lloyd V. Berkner Travel Fellowship** from **American Geophysical Union (AGU)** to attend AGU Fall Meeting 2023, San Francisco, CA, USA.
  - **2023: CSIR Foreign Travel Grant** to attend **European Geosciences Union (EGU)** General Assembly 2023.
  - **2023: SERB-DST ITS (International Travel Support) Grant** to attend **European Geosciences Union (EGU)** General Assembly 2023.
  - **2023: Early Career Scientist's Travel Support Grant (Roland Schlich Travel Support)** of **EGU** General Assembly 2023.
  - **2022: American Geophysical Union (AGU) Ecohydrology Early Career Tiny Grant** at AGU Fall Meeting 2022, Chicago, USA. [Recieved senate appreciation]
  - **2022: Travel Grant** through FAAC Scheme IISER Bhopal, 2022.
  - **2022: Student travel grant** to attend the "6th soil moisture application and validation workshop 2022," Perugia, Italy.
  - **2021: American Geophysical Union (AGU) Ecohydrology Early Career Tiny Grant** at AGU Fall Meeting 2021, New Orleans, Louisiana, USA. [Recieved senate appreciation]
  - **2021: Student travel grant from American Geophysical Union (AGU)** to attend the AGU Fall Meeting 2021, New Orleans, Louisiana, USA.
  - **2020: Full scholarship** to attend the highly competitive "**Machine Learning Summer School**" at Telkom University, Indonesia.
  - **2019: DAAD fellowship** for attending a summer school on "Geospatial data science using R" at Friedrich Schiller University Jena, Germany (fully funded). [Recieved senate appreciation]
- **AWARDS**
  - **Best Poster Presentation Award (consolation prize)** in the ORB 2022 (2^{nd} Departmental day of the Earth and Environmental Sciences, IISER Bhopal).
- **MEDIA COVER and MENTIONS**
  - **2022:** Nominated for the **AGU Earth and Planetary Surface Processes (EPSP)** Early Career Spotlight. (Read the complete interview)
  - **2021:** Featured as a leaf in the **"Meet a leaf"** series of **American Geophysical Union (AGU) ecohydrology**. (Read the complete interview)

SKILLS

- Computer Programming: C, MATLAB™, Python, R.
- Analytical: Data Analysis, Machine Learning, Deep Learning.
- Web Development: PHP, HTML, CSS.
- Hardware Description Language: VHDL, Verilog.

- Hardware Hands on: Microcontrollers (MSP430), Raspberrypi.
- Miscellaneous: OS: Linux, PPT: LaTeX beamer, Documentation and Report: LaTeX, MS word & Inkscape.
- Languages: English, Hindi, Bengali.

MISCELLANEOUS EXPERIENCE

- Professional Affiliations
  - ISPRS Individual Membership (Member Id: 61733, Member since 2018).
  - IEEE Membership (student) (Member Id: 95635042, Member since 2019).
    - IEEE Geoscience and Remote Sensing, IEEE Communications, IEEE Sensors Council, IEEE Signal Processing & IEEE Young Professionals.
  - Indian Radio Science Society (Member Id: S2019022, Member since 2019).
  - European Geosciences Union (Member Id: 474981, Member since 2020).
  - American Geophysical Union (Member Id: 1367956, Member since 2021).
- Leadership Roles in IEEE
  - Ambassador for the IEEEXtreme 14.0 (Region-10, IEEE M.P Sub Section).
- Reviewer

  Remote Sensing of Environment (Elsevier), Artificial Intelligence Review (Springer), Complex & Intelligent Systems (Springer), Journal of Ambient Intelligence and Humanized Computing (Springer), Journal of Intelligent and Fuzzy Systems (IOS Press), IEEE Access (IEEE), The Journal of Open Source Software, Advances in Space Research (Elsevier), Wireless Personal Communications (Springer), Journal of The Institution of Engineers (India): Series B (Springer), Expert Systems With Applications (Elsevier), Big Data Mining and Analytics (Tsinghua University Press), Engineering Applications of Artificial Intelligence (Elsevier), International Journal of Digital Earth (Taylor & Francis), Cybernetics and Systems (Taylor & Francis), Web Intelligence (IOS Press), Computer Methods in Biomechanics and Biomedical Engineering (Taylor & Francis), The Journal of Supercomputing (Springer), Connection Science (Taylor & Francis), Intelligent Systems with Applications (Elsevier), Remote Sensing (MDPI), Computer Networks (Elsevier), Computers and Electronics in Agriculture (Elsevier).
- Certification (Selected)
  - Certificate of Achievement in Electronic Material and Devices from edX Verified. Massachusetts Institute of Technology. E-learning. *(Click)*
  - Certificate of Achievement in MATLAB Verified. MathWorks. E-learning. MATLAB Onramp self-paced training course. *(Click)*

TRAININGS/ WORKSHOPS/ CONFERENCES ATTENDED

- Attended "European Geosciences Union (EGU) General Assembly 2023," April 24^{th}-28^{th}, 2023, Vienna, Austria.
- Attended "6th soil moisture validation and application workshop," June 07^{th}-09^{th}, 2022, Perugia, Italy.
- Attended "Machine Learning Summer School (MLSS)" August 03^{rd}-09^{th}, 2020. Organized by Telkom University, Indonesia.

- Attended a summer school on "Geospatial data science using R" August 26^{th}-31^{th}, 2019. Organized by Friedrich Schiller University Jena, Germany.
- Attended a Conference on "Unmanned Aerial System in Geomatics" April 06^{th}-07^{th}, 2019. Organized by IIT Roorkee, Greater Noida Extention Center, U.P, India.
- Attended a one day workshop on "Radar Training Workshop" Organized by URSI Asia pacific radio science conference, held on 10^{th} March 2019 at IHC, New Delhi.
- Attended a winter school on "Artificial Intelligence" Organized by Infosys Center for Artificial Intelligence at Indraprastha Institute of Information Technology Delhi (IIIT D), held on 18^{th}-21^{st} January 2019.
- Attended a two day workshop on "Training Course on Remote Sensing, GIS and Machine Learning Methods for Environment, Natural Resources and Agriculture" Organized by Indraprastha Institute of Information Technology Delhi (IIIT D) in collaboration with Indian society for ecological economics, held on 4^{th}-5^{th} January 2019.
- 15 day visit as Project JRF on NISAR project at Indian Institute of Remote Sensing, ISRO, Dehradun, India, 16^{th} December - 30^{th} December '18.
- Attended a one day workshop on "Data Science using R" Organized by Center for Computational Biology, Indraprastha Institute of Information Technology Delhi (IIIT D), held on 15^{th} December 2018.
- Attended the "NISAR Science Workshop" November 15^{th}-17^{th}, 2018. Space Applications Centre, ISRO, Ahmedabad, India.
- Attended a short-term training course on "SAR Data Processing and Analysis for Land Applications with Special Emphasis on L− & S−Bands" Organized by Space Application Centre, ISRO, Ahmedabad, India, 06^{th}-10^{th} August 2018.
- 15 day visit as Project JRF on NISAR project at Indian Institute of Remote Sensing, ISRO, Dehradun, India, 21^{st} May - 04^{th} June 2018.
- Attended a one day workshop on "Application of Satellite Altimetry for inland Waterbodies" Organised by Indian Institute of Remote Sensing, ISRO, Dehradun, India, 30^{th} May 2018.

INVITED SPEAKER/ RESOURCE PERSON

- Delivered a talk on **"Remote sensing and machine learning for disease prediction,"** in the High end workshop on **"Geoinformatics Applications in Environmental Research"** at Division of Environmental Health and Epidemiology, **ICMR-National Institute for Research in Environmental Health (ICMR-NIREH) Bhopal**, 18^{th}-24^{th} January 2023, Sponserd by SERB-DST.
- Delivered a talk on **"Remote sensing for soil moisture and agriculture,"** in the High end workshop on **"Geoinformatics Applications in Environmental Research"** at Division of Environmental Health and Epidemiology, **ICMR-National Institute for Research in Environmental Health (ICMR-NIREH) Bhopal**, 18^{th}-24^{th} January 2023, Sponserd by SERB-DST.

REFERENCES

1. Dr. Kumar Gaurav, Assistant Professor
   Department of Earth and Environment Sciences, Indian Institute of Science Education and Research Bhopal, India. Email:kgaurav@iiserb.ac.in
2. Dr. Shashi Kumar, Scientist/Engineer - 'SF'
   Department of Photogrametry & Remote Sensing, Indian Institute of Remote Sensing, Dehradun, Indian Space Research Organisation (ISRO). Email: shashi@iirs@gov.in

3. Dr. Vaibhav Kumar, Assistant Professor
   Department of Data Science and Engineering, Indian Institute of Science Education and Research Bhopal, India. Email: vaibhav@iiserb.ac.in
4. Dr. Sandeep Sharma, Assistant Professor
   Department of Electronics Engineering, Madhav Institute of Technology and Science, Gwalior, India. Email: sandeepsvce@mitsgwalior.in

The information stated above are true to the best of my knowledge and abilities.

October 3rd, 2023

Abhilash Singh