SAGAR LEKHAK

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RESEARCH PROFILE

Imaging scientist and engineer specializing in UAV based humanitarian landmine detection, hyperspectral imaging, statistical target detection, machine learning, and multisensor experimentation. Research contributions span airborne metal detection, benchmark datasets, domain adaptation, uncertainty quantification, and international field campaigns. Current research interests include physics informed sensor fusion and adaptive sensing for surface and buried explosive hazards.

EDUCATION

PhD, Imaging Science, Rochester Institute of Technology (RIT) Expected August 2027
MS, Imaging Science, Rochester Institute of Technology 2025 GPA: 3.96/4.00
Graduate Student Delegate, RIT College of Science (2026): Selected by the Dean to represent graduates across six departments and deliver commencement remarks.
BE, Electronics and Communication Engineering, Tribhuvan University, Nepal 2022
Selected graduate coursework: Computer Vision; Robust Machine Learning for Multidisciplinary Imaging Applications; Applied Machine Learning for Difficult Data; Spectral Image Analysis; Radiometry; Image Processing and Discrete Fourier Methods.

RESEARCH EXPERIENCE AND LEADERSHIP

Graduate Researcher, Digital Imaging and Remote Sensing Laboratory, RIT 2023 to present
- Helped coordinate the ROCX 2025 multinational experimental campaign with RIT and Royal Military Academy of Belgium collaborators, investigating UAV and ground sensing of 110 inert surface PFM 1 mine targets.
- Developed UAV hyperspectral processing and detection workflows involving radiometric calibration, reflectance retrieval, registration, spectral analysis, and statistical and learning based detection.
- Contributed to comparative evaluation of 34 datasets spanning nine sensing modalities, examining practical capabilities and limitations for surface and buried threat detection.
- Developed RGB detection benchmarks and evaluated robustness to domain shift, including transfer between acquisition sequences and uncertainty aware inference.
- Participating in planning for the proposed ROCX 2027 campaign, with an expanded research scope involving surface and subsurface detection and multimodal sensing.

International Research Traineeship, Universidad Politecnica de Cartagena, Spain 2022
Erasmus+ KA107 traineeship contributing to an integrated multisensor platform for environmental variable monitoring, including sensor integration, data acquisition, and system development.

SELECTED RESEARCH CONTRIBUTIONS

- **SULAND_v2 RGB benchmark:** 33,771 images, 12,433 annotated bounding boxes, and evaluations of 35 detector configurations across nine model families, including domain shift experiments.
- **UAV hyperspectral mine detection:** VNIR data with 270 bands spanning approximately 398 to 1002 nm; benchmarked statistical target detectors and deep learning approaches with pixel level reference labels.
- **Human guided spectral detection:** Developed an iterative signature bootstrapping workflow for mine detection with released Python implementation.
- **Uncertainty analysis:** Investigated Monte Carlo dropout and ResNet 50 classification under noise and adversarial perturbations.

PEER REVIEWED JOURNAL ARTICLES

1. J. Baur, **S. Lekhak**, G. Steinberg, et al. "A Comparative Evaluation of UAV Based Remote Sensing and Geophysical Techniques for Landmine Detection on a Seeded Minefield." *Remote Sensing*, 18(13), 2182, 2026. doi:10.3390/rs18132182.
2. **S. Lekhak**, E. J. Ientilucci, and A. W. Brinkley. "Viability of Substituting Handheld Metal Detectors with an Airborne Metal Detection System for Landmine and Unexploded Ordnance Detection." *Remote Sensing*, 16(24), 4732, 2024. doi:10.3390/rs16244732.

Accepted: "Enhancing Full waveform LiDAR based Leaf Area Index Modeling via Signal Deconvolution." *Remote Sensing Letters*, accepted September 2026 (coauthor).

CONFERENCE PAPERS AND RESEARCH PREPRINTS

- **S. Lekhak** et al. "Benchmarking Deep Learning and Statistical Target Detection Methods for PFM 1 Landmine Detection in UAV Hyperspectral Imagery." IEEE IGARSS 2026. arXiv:2602.10434.
- **S. Lekhak** et al. "A UAV Based VNIR Hyperspectral Benchmark Dataset for Landmine and UXO Detection." IEEE InGARSS 2025. arXiv:2510.02700.
- **S. Lekhak** et al. "Uncertainty Quantification in Surface Landmines and UXO Classification Using MC Dropout." IEEE IGARSS 2025. arXiv:2510.06238.
- **S. Lekhak** et al. "Human in the Loop Signature Bootstrapping for UAV Hyperspectral PFM 1 Mine Detection." IEEE

WHISPERS 2026, accepted oral presentation. arXiv:2607.25310.
- **S. Lekhak** et al. "SULAND_v2: A Refined RGB Dataset and Deep Learning Object Detection Benchmark for UAV/UGV Based Surface Landmine Detection Under Domain Shift." Research preprint. arXiv:2607.28996.

ADDITIONAL MANUSCRIPTS SUBMITTED

- "Unsupervised Domain Adaptation for RGB Surface Landmine Detection: Sequence Held Out Evaluation on SULAND_v2." Submitted to *Remote Sensing*, September 2026.
- "UAS Guided Harmonization of Airborne Imaging Spectroscopy for Scaling Leaf Area Index Retrieval in Fire Driven Mediterranean Shrublands." Submitted to *ISPRS Open Journal of Photogrammetry and Remote Sensing*, August 2026 (coauthor).

SELECTED TALKS, PRESENTATIONS AND PROFESSIONAL ENGAGEMENT

- **IEEE Global Humanitarian Technology Conference (GHTC), 2026:** Invited speaker and academic sector representative on the "Innovation in Mine Action" panel alongside the Geneva International Centre for Humanitarian Demining (GICHD), an international mine action foundation, and Mines Advisory Group (MAG), a humanitarian demining NGO. Discussed UAV multisensor imaging and AI for mine detection.
- **IEEE WHISPERS 2026, Glasgow:** Accepted oral presentation on human guided hyperspectral signature bootstrapping.
- **IEEE IGARSS 2026, Washington, DC:** Two oral presentations on hyperspectral detection benchmarking and the ROCX 2025 campaign.
- **IEEE STRATUS 2026, Rochester:** Oral presentation on the ROCX 2025 multisensor PFM 1 experiment.
- **IEEE InGARSS 2025, Bhubaneswar:** Oral presentation on UAV hyperspectral benchmark data.
- **IEEE IGARSS 2025, Brisbane:** Oral presentation on uncertainty quantification for mine and UXO classification.
- **Humanitarian Demining Innovation and Technology Summit (HITS24), Chesham, UK, September 2024:** Participated in an invitation only summit of approximately 50 researchers, innovators, and entrepreneurs addressing AI, UAV sensing, sensor technologies, benchmarking, and humanitarian demining strategies.

INTERNATIONAL AND SELECTED RESEARCH HONORS

- **IEEE GRSS Excellence in Technical Communication Student Prize:** First Prize and People's Choice, IGARSS 2026; Second Prize, IGARSS 2025.
- **Outstanding Innovation and Research Award**, IEEE Rochester Joint Chapters Meeting, 2026. Awarded for presentation of UAV multisensor benchmarking and AI fusion research for humanitarian demining.
- **Best Student Oral Presentation**, IEEE STRATUS 2026.
- **Best Student Presentation Award**, CRC Press / Taylor & Francis, 2026.
- **First Prize**, RIT PhD Three Minute Thesis Competition, 2025.
- **Steven M. Wear Endowed Fund Award**, RIT, 2024.

ACADEMIC SERVICE, LEADERSHIP AND TECHNICAL COMMUNICATION

- **Vice Chair**, IEEE Geoscience and Remote Sensing Society, Western New York Chapter, since 2025.
- **Peer reviewer**, IEEE Transactions on Geoscience and Remote Sensing; IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing; IEEE InGARSS 2025.
- **President**, Nepalese Student Association, RIT.
- **Licensed Engineer**, Nepal Engineering Council, 2023.

TEACHING AND MENTORING

Teaching support in Radiometry, Human Visual System, and Linear and Fourier Methods for Imaging at RIT. Mentored students in Python, scikit learn, and PyTorch through the RIT Coding Resource Center.

TECHNICAL EXPERTISE

Imaging and sensing: Hyperspectral and RGB imaging, radiometric calibration, reflectance retrieval, spectral target detection, multisensor registration, UAV remote sensing, computational imaging.
Machine learning and analysis: Computer vision, deep learning, domain adaptation, uncertainty quantification, detection evaluation.
Software: Python, PyTorch, scikit learn, OpenCV, ENVI, QGIS, DIRSIG, Git, Linux.