Adugna G. Mullissa
Ph.D. in Radar Remote Sensing

PERSONAL STATEMENT

I am a committed, knowledgeable and enthusiastic scientist in remote sensing and machine learning for environmental monitoring. My research interest is using microwave remote sensing and machine learning to improve accuracy and efficiency in environmental monitoring with a particular focus on SAR, PolSAR and InSAR signal processing and information extraction using deep neural networks. I have worked on state-of-the-art deep learning models for SAR and PolSAR image despeckling, PolSAR image semantic segmentation, SAR image time-series analysis, forecast and segmentation for crop classification and forest monitoring. I have extensive experience in cloud computing of big remote sensing data (Google Earth Engine) and have advanced programming skills in Python, JavaScript and Matlab.

EDUCATION

01/11/2013–22/12/2017 **University of Twente |Enschede, The Netherlands**

PhD: Radar remote sensing

- Supervisor: Prof. dr. ir. Alfred Stein
- Dissertation title: Quality aspects of distributed scatterers in polarimetric differential SAR interferometry.

01/09/2006–01/07/2008 **Addis Abeba University | Addis Abeba, Ethiopia**

MSc: Remote Sensing and GIS

- Dissertation title: The role of faults and fractures on ground water occurrence and flow in the upper Awash basin, Ethiopia.

01/11/1998–01/07/2004 **Addis Abeba University | Addis Abeba, Ethiopia**

BSc: Geology

EXPERIENCE

15/04/2019–present

Researcher on Fundamental radar and deep learning methods for near-real time deforestation monitoring | Wageningen University, Wageningen, The Netherlands

- As the core member of the RADD alert team, I designed and implemented the Sentinel-1 based RADD alert core processing modules.
- Researched, developed and implemented a Sentinel-1 SAR analysis ready data preparation framework in Google Earth Engine.
- Developed a spatio-temporal transformer model to monitor seasonal dry forest change using Google Earth Engine and Tensorflow.
- Researched, developed and implemented a deep learning based near real-time tropical humid forest and dry forest change monitoring system integrating Google Earth Engine, Google Cloud and Google AI platform.
- Researched and developed a deep learning based generalized SAR image despeckling method.

01/01/2018–01/01/2019

Researcher on Machine Learning Based Agricultural Monitoring | University of Twente, Enschede, The Netherlands

- Researched and developed a complex-valued deep fully convolutional network (FCN) for the classification of crops from Sentinel-1 images.
- Developed and integrated the complex-valued fully convolutional network building blocks in the open source Matlab based neural network toolbox (MatConvNet).

15/09/2016–01/01/2017

Visiting Research Scientist | Purdue University, West Lafayette, USA

- Researched and developed a polarimetry based distributed scatterer processing method for permanent scatterer SAR interferometry application.

01/11/2013–22/12/2017

Ph.D. Candidate | University of Twente, Enschede, The Netherlands

- Researched and developed methods that improved the interferometric phase quality over distributed scatterers by exploiting polarimetric diversity in the context of multi-temporal differential SAR interferometry.

PROJECT PARTICIPATION

- **RADD:** A world resource institute and Global forest watch project in near-real time deforestation monitoring.
- **MINERVA**: An NWO funded Ducth radar remote sensing network for crop monitoring using radar data.

PUBLICATIONS

- Gou, Y., Balling, J., De Sy, V., Herold, M., De Keersmaecker, W., Slagter, B., Mullissa, A., Shang, X., & Reiche, J. (2022). Intra-annual relationship between precipitation and forest disturbance in the African rainforest. Environmental Research Letters, 17(4), 044044. https://doi.org/10.1088/1748-9326/ac5ca0 (Impact factor 6.14)
- Robert N. Masolele, Veronique De Sy, Martin Herold, Diego Marcos, Jan Verbesselt, Fabian Gieseke, Adugna G. Mullissa, Christopher Martius, Spatial and temporal deep learning methods for deriving land-use following deforestation: A pan-tropical case study using Landsat time series, *Remote Sensing of Environment*, Volume 264, 2021. (Impact factor 10.16)
- Mullissa, A.; Vollrath, A.; Odongo-Braun, C.; Slagter, B.; Balling, J.; Gou, Y.; Gorelick, N.; Reiche, J. Sentinel-1 SAR Backscatter Analysis Ready Data Preparation in Google Earth Engine. **Remote Sensing**. 2021, 13, 1954. https://doi.org/10.3390/rs13101954 (Impact factor 5.33)
- Mullissa,A.G., C. Persello and J. Reiche, "Despeckling Polarimetric SAR Data Using a Multistream Complex-Valued Fully Convolutional Network," in *IEEE Geoscience and Remote Sensing Letters*, vol. 19, pp. 1-5, 2022, Art no. 4011805, doi: 10.1109/LGRS.2021.3066311. (Impact factor 3.83).
- Mullissa,A.G., D. Marcos, D. Tuia, M. Herold and J. Reiche, "deSpeckNet: Generalizing Deep Learning-Based SAR Image Despeckling," in *IEEE Transactions on Geoscience and Remote Sensing*, vol. 60, pp. 1-15, 2022, Art no. 5200315, doi: 10.1109/TGRS.2020.3042694.(Impact factor: 5.8)

- Reiche,J., Mullissa,A.G., Slagter,B, Gou,Y., Tsendbazar,N., Braun,C., Vollrath,A., Weisse,M.J., Stolle,F., Pickens,A., Donchyts,G., Clinton,N., Gorelick,N., and Herold,M. 2020. Forest disturbance alerts for the Congo Basin using Sentinel-1. **Environmental Research Letters** (Impact factor: 6.03)

- Vollrath,A., Mullissa,A.G., Reiche,J. 2020. Radiometric slope correction for Sentinel-1 on Google Earth Engine. **Remote Sensing.** (Impact factor 4.11).

- Mullissa, A.G., Persello, C., Stein, A. PolSARNet: A Deep Fully Convolutional Network for Polarimetric SAR Image Classification. **IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing**, VOL. 12, NO. 12, 5300-5309, 2019. (Impact factor 3.39)

- Mullissa, A.G., Perissin, D., Tolpekin, V., Stein, A. Polarimetry-Based distributed scatterer processing method for PSI applications. **IEEE Transactions on Geoscience and Remote Sensing**, VOL. 56, NO. 6, 3371-3382, 2018. (Impact factor 5.63)

- Mullissa, A.G., Tolpekin, V., Stein, A., 2017. Scattering property based contextual PolSAR speckle filter. **International Journal of Applied Earth Observation and *Geoinformation*** 63:78–89, 2017. (Impact factor 4.84)
- Mullissa, A.G., Tolpekin, V., Stein, A., Perissin, D., 2017. Polarimetric differential SAR interferometry in an arid natural environment. **International Journal of Applied Earth Observation and Geoinformation** 59:9–18, 2017. (Impact factor 4.84)

Books

- Mullissa, A.G., Quality aspects of distributed scatterers in polarimetric differential SAR interferometry. *University of Twente*. ISBN: 978-90-365-4457-3, December 2017
- Mullissa, A.G., The Role of Faults and Fractures on Groundwater Occurrence and Flow: An Integrated Remote Sensing, GIS, a Qualitative Aquifer Characterization and Conceptualization Approach, *Verlag Dr. Müller*, ISBN: 978-3639243390, March 2010.

Conference proceedings

- Mullissa,A.G., Persello, C., Tolpekin, V., "Fully convolutional networks for multi-temporal SAR image classification," in IEEE *Geoscience and Remote Sensing Symposium (IGARSS),* 6639-6642, 2018, Valencia, Spain.
- Mullissa,A.G., Marcos, D., Herold, M., Reiche, J., "Dual Polarimetric SAR Covariance Matrix Estimation using Deep Learning in IEEE *Geoscience and Remote Sensing Symposium (IGARSS),* 2020, Virtual.

Oral presentations

- Mullissa, A.G., Perissin, D., Tolpekin, V., Stein, A., 2017. Scattering property based adaptive filtering of dual polarization Sentinel-1 data for PSI application. *Fringe 2017*, Helsinki, Finland
- Mullissa,A.G., Persello, C., Tolpekin, V., 2018. Fully convolutional networks for multi-temporal SAR image classification, IEEE *Geoscience and Remote Sensing Symposium (IGARSS 2018),* Valencia, Spain.
- Mullissa,A.G., Marcos, D., Herold, M., Reiche, J., "Dual Polarimetric SAR Covariance Matrix Estimation using Deep Learning in IEEE *Geoscience and Remote Sensing Symposium (IGARSS 2020)*, Virtual

Invited talks

- Presented "Quality aspects of distributed scatterers for Polarimetric differential SAR interferometry" to the civil engineering and geodesy group at *TU Delft*, Netherlands, March 2018.

- Presented "Sentinel-1 SAR based analysis ready data preparation in google earth engine" at the International Conference and Workshop on Artificial Intelligence Remote Sensing for Forestry Applications, November 2021.

Google Scholar

ResearchGate

TEACHING AND SUPERVISION EXPERIENCE

- Advanced Earth Observation Course (Lecture on Polarimetric SAR)(2021, 2022)
- Remote Sensing and GIS integration expert course (2021,2022)
- Msc Thesis supervision
  - Federico Fraciamore (2019)
    - Thesis title: Deep learning based deforestation detection using dense Sentinel-1 data.
  - Huanhuan Li (2021)
    - Thesis title: Assessing challenges of generating training labels for machine learning based cocoa mapping.
  - Margret Azuma (2021)
    - Thesis title: Comparing a Fully Convolutional Neural Network and Histogram-based Thresholding Technique for radar-based Flood Mapping in Various Land Cover Classes
  - Clara Siegert (2022)

- Thesis title: Seasonal forest disturbance mapping using Sentinel-1/2 data
    - o Nikoletta Moriati (2022)
        - Sentinel data and machine learning for cocoa mapping in West Africa
    - o Shoyo Nakamura (2022)
        - Small scale forest disturbance mapping using High resolution SAR and Deep learning.
- Msc Internship supervision
    - o Federico Fraciamore
    - o Yuhang Yu
    - o Daan Pisorius
    - o Akinyele Damilola
    - o Clara Siegert

SKILLS

- **Research:** Creative and critical thinking. Design of experiments, data collection, data analysis and result interpretation.
- **Communication:** Technical writing, editing, speaking and presentation skills.
- **Language skills**: Amharic (mother tongue), English (C2 level) and Dutch (A2 level).
- **Management:** Planning and organizing resources, Teamwork facilitation, time management.
- **Programming skills:** *Python* (Tensorflow, Keras, SciPy, NumPy, Scikit, OpenCV, Google Earth Engine python API), *Matlab* (Image processing, signal processing, statistics, computer vision, Matconvnet) and *Javascript* (Google Earth Engine).
  Github repository: https://github.com/adugnag .
- **Operating systems:** Windows, MacOS and Linux;
- *Remote Sensing and GIS software:* ERDAS, ENVI, PolSARpro, SNAP toolbox, Q-GIS, ArcGIS;
- **Typesetting:** LATEX and Microsoft office.

JOURNAL REVIEWER EXPERIENCE

- IEEE Transactions on Geoscience and Remote Sensing
- ISPRS Journal of Photogrammetry and Remote Sensing
- IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing (J-STARS)
- IEEE Geoscience and Remote Sensing Letters
- International Journal of Digital Earth
- Remote Sensing
- Remote Sensing of Environment

Publons

CERTIFICATION

- Tensorflow Professional Developer Certificate (Issued July 2022) (https://www.credential.net/a78c8d90-f0e1-45b6-8bf3-834268671dc5#gs.8okc5f)

PROFESSIONAL MEMBERSHIPS

- IEEE Geoscience and Remote Sensing Society (**IEEE GRSS**)

AWARDS

- European Space Agency (ESA) data grant under project number 20930, 2014
- Msc. Research grant by the French ministry of culture, 2008.