MOHAMMAD REZA FATHI

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EDUCATION

K.N. Toosi University of Technology *Sep 2021 – Sep 2024*
Master of Science, Remote Sensing **GPA: 3.65/4.0**

Thesis Topic: *Development of a Web-based Python Application Utilizing Cumulative Sum (CUSUM) for Temporal Analysis of Remote Sensing Data to Monitor Forest Degradation and Decline Using Google Earth Engine: A Case Study in the Hyrcanian Forests.*

Supervisors: Dr. Hooman Latifi & Dr. Siddhartha Khare | Advisor: Dr. Yasser Maghsoodi

University of Bojnord *Sep 2016 – Feb 2021*
Bachelor of Engineering, Geomatics Engineering **GPA: 3.14/4.0**
Supervisor: Dr. Yasser Jouybri

RESEARCH INTEREST

- Ecological Remote Sensing
- Forest Disturbance Monitoring
- Spectral Variation Hypothesis
- Time Series Approaches
- Trend Analysis
- Physics-Based Models

PUBLICATIONS

Fathi, M. R., Latifi, H., Gholizadeh, H., & Khare, S. (2024). *PaRaVis: An automatic Python graphical package for ensemble analysis of plant beta diversity using remote sensing proxies.* **Ecological Informatics**, 102739. https://doi.org/10.1016/j.ecoinf.2024.102739

CONFERENCES AND PRESENTATIONS

Introducing ***PaRaVis*** as a powerful graphical Python tool for seamless plant diversity analysis from space-borne data.
BES Annual Meeting 2024 (Oral Presentation) *12 Dec 2024*
Session: S34: Ecosystem and Functional Ecology - Monitoring Presented by: Dr. Hooman Latifi

ACADEMIC EXPERIENCE

Teaching Assistant K.N. Toosi University of Technology, Tehran, IR – MSc Course
Ecological Applications of Remote Sensing for Ecosystem Monitoring – Theory & Practice *Feb – Jul 2024*

- Assisted Dr. Hooman Latifi in developing and delivering course content, including conducting practical Python programming sessions. Designed exercises to integrate key ecological concepts, such as community growth, carrying capacity, and biodiversity metrics (α, β, and γ diversity), linking ecological patterns with remote sensing data.

Field Work Hyrcanian Forest for Oak Charcoal Disease (OCD)
Golestan province, Ghorogh forest park *Jul – Aug 2023*

- Let field data collection, processing, and analysis to validate the CUSUM-based approach for detecting forest decline caused by OCD.

Very High-Resolution Remote Sensing Datasets

- Prepared and submitted project proposals to request data access, managed satellite tasking, and conducted data preprocessing for ecological and forestry applications. DATASETS: WorldView-2/3 | SPOT-6/7 | Pléiades | Pléiades Neo

Synthetic Aperture Radar (SAR) Analysis

- Processed and analyzed Sentinel-1 SAR data for forest disturbance monitoring, including extracting indices from amplitude data and generating interferograms for time-series analysis.

Integration of Environmental Datasets in Remote Sensing Analysis

- Integrated environmental datasets, such as ERA5, Landsat LST, SRTM, NASADEM, and Copernicus DEM, to enhance environmental analysis in remote sensing projects.

TECHNICAL SKILLS

Programming Skills

- Geospatial Analysis: Rasterio | GDAL | GeoPandas | rioxarray | xarray | Spyndex
- Machine Learning & Neural Networks: Scikit-learn | TensorFlow
- Data Processing: Numpy | Pandas
- Visualization Tools: Matplotlib | Seaborn | Plotly | Folium
- Parallel Processing: Ray | Dask
- GUI/API Development: Tkinter | Ipywidgets | Streamlit
- Cloud Computing: Google Earth Engine | GEEmap | Planetary-computer

Google Earth Engine

- Time series analysis: Monitoring forest decline and dieback | Trend analysis
- Change detection: Forest degradation and deforestation
- Supervised & Unsupervised classification: Land Use(LU)/Land Cover(LC) classification
- API development (EE as backend): User-friendly web app and GUI development

SELECTED PROJECTS

PaRaVis (Parallel Rao's Q Visualization): Developed a graphical Python package for seamless extraction, analysis, and visualization of plant diversity in terrestrial ecosystems using remote sensing datasets. GitHub | Zenodo | PyPI

DiTiMO (Disturbance Time-series Monitoring): Created a web application leveraging Google Earth Engine for near real-time monitoring of forest disturbances and environmental changes. (Will be publicly accessible after publication.) (Learn more and request early access)

Time-Series Analysis of Landsat Data: Conducted long-term monitoring of forest ecosystem health and phenology using Landsat time-series data: A Case Study in the Hyrcanian Forests.

Detecting Land Use Changes in Vegetation Areas: Developed a CUSUM-based approach utilizing harmonized Landsat-Sentinel datasets and SAR Sentinel-1 to identify and quantify land use changes in vegetation areas over time.

Land Use Land Cover (LULC) Classification: Applied Artificial Neural Networks (ANN) and Fuzzy Classifiers to classify high-resolution satellite imagery, enhancing land use classification accuracy for environmental monitoring.

SELECTED COURSES

Photogrammetry & Remote Sensing Assisted Vegetation Studies *K.N. Toosi University of Technology*
Prof. Hooman Latifi **Score: 15.3/20**

Ecological Applications of Remote Sensing for Ecosystem Monitoring (Theory & Practice) *K.N. Toosi University of Technology*
Prof. Hooman Latifi **Score: 15.16/20**

Fuzzy Logic & Neural Networks in Photogrammetry & Remote Sensing *K.N. Toosi University of Technology*
Prof. Mehdi Mokhtarzade **Score: 17.75/20**

Microwave Remote Sensing *K.N. Toosi University of Technology*
Prof. Mahmod Sahebi **Score: 17.5/20**

UAV-Based Photogrammetry *K.N. Toosi University of Technology*
Prof. Masood Varshosaz **Score: 18.3/20**

REFERENCES

• Prof. Hooman Latifi
Associate Professor — Role: MSc Primary Supervisor
Department of Photogrammetry and Remote Sensing — hooman.latifi@kntu.ac.ir
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• Prof. Siddhartha Khare
Assistant Professor — Role: MSc Secondary Supervisor
Department of Civil Engineering — siddhartha.khare@ce.iitr.ac.in
Indian Institute of Technology (IIT) Roorkee, Roorkee, Uttarakhand, India — +91-1332-28-5459 (Work)

• Prof. Hamed Gholizadeh
Assistant Professor — Role: Scientific Advisor
Department of Geography — hamed.gholizadeh@okstate.edu
Oklahoma State University, Stillwater, Oklahoma, United States — (405) 744-2864 (Work)