

Erfan Eshghollahi

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👤 PROFILE

I am a GeoAI Researcher and Geospatial Engineer dedicated to advancing Earth Observation through the next generation of AI: Geospatial Foundation Models.

Currently, my research focuses on the intersection of advanced deep learning and remote sensing. I specialize in calculating and optimizing embeddings for large-scale geospatial foundation models, specifically addressing the challenge of data scarcity. By developing techniques to fine-tune these models with small amounts of labeled data, I enable robust performance across diverse Earth Observation use cases without the need for massive, expensive datasets.

My research is grounded in a deep technical foundation of geospatial engineering. I possess expert-level proficiency in the Python geospatial stack (GeoPandas, Rasterio, GDAL) and extensive experience building pipelines that structure and clean complex spatial data. Whether working with traditional CNNs/U-Nets or modern Transformers, I approach every problem with a full-stack mindset from database management (PostGIS/SQL) to model deployment.

I am passionate about translating this high-level research into actionable business insights, helping organizations leverage state-of-the-art AI to solve real-world environmental and spatial challenges.

🎓 EDUCATION

Doctor of Philosophy 02/2026 – Present
Politecnico di Milano Milan,Italy

MSc.Geoinformatics Engineering 09/2023 – 2025
Politecnico di Milano MILANO, Italy

BSc.Surveying Engineering 09/2017 – 09/2022

🧠 SKILLS

- Database SQL
- Data analysis
- Statistics
- Python programming
- presentation
- AI and deep learning
- Image analysis

🌐 LANGUAGES

English C1	● ● ● ● ●	French B1	● ● ● ● ●
Persian C2	● ● ● ● ●	Italian A2	● ● ● ● ●

PROFESSIONAL EXPERIENCE

PhD Candidate in GeoAI

Politecnico di Milano

02/2026 – Present
Milan, Italy

actively researching and developing applications for Geospatial Foundation Models within the domain of Earth Observation. My core focus includes designing workflows for calculating model embeddings and implementing fine-tuning strategies to adapt these large-scale models for specific, high-impact geospatial use cases, particularly in scenarios with limited labeled data.

Geospatial Analyst Intern in Planetek italia

Planetek Italia

2025 – 06/2025
Milan, Italy

The project aims to detect plastic nets in agricultural water systems using Sentinel-2 imagery and machine learning models (Random Forest and XGBoost) within the WADIT (Water Digital Twin) framework. It supports sustainable water management by integrating Earth Observation data with AI-based classification and validation workflows.

Junior researcher in Deep Learning for MOLCA Imagery Analysis

Politecnico di Milano

09/2024 – 12/2025
Milan, Italy

Conducting research on applying deep learning CNN models to MOLCA imagery data, aiming to advance geospatial analysis by integrating with the NASA-IBM foundation model for enhanced environmental insights.

PROFESSIONAL PROJECTS

Data Cleaning Pipeline Implementation

2024

We conducted a comprehensive **data cleaning and preprocessing** pipeline for a crime incident dataset to improve its quality and reliability. Our approach involved **handling spatial missing values** through imputation and geocoding, **resolving inconsistencies** such as dependency violations, and **standardizing formats** for structured analysis. We applied **exploratory data analysis (EDA)** to assess completeness, uniqueness, and data constancy, ensuring a high-quality dataset. The final cleaned dataset is now well-structured, consistent, and ready for analytical, predictive tasks and visualisation.

Semantic Segmentation of Mars Terrain Using Deep Learning

2024

Custom Parallel Dual UNet for Multi-Scale Feature Extraction and Boundary-Aware Classification

Developed a deep learning model, Custom Parallel Dual UNet, for Mars terrain segmentation using multi-scale feature extraction. Implemented a custom loss function combining Focal Loss, Dice Loss, and Boundary Loss to address class imbalance and boundary accuracy. Applied data cleaning, augmentation, and optimization techniques to improve model performance.

Geospatial Raster Processing Library for Remote Sensing

2024

Enhancing Image Contrast and Distribution in GIS Applications

Developed a Python library for geospatial raster processing, enabling efficient histogram manipulation in remote sensing and GIS workflows. Key features include histogram stretching, matching, and equalization to enhance image contrast and ensure analytical consistency. Designed for accessibility, the library simplifies preprocessing for improved visual interpretation and analysis.

Burnt Area Detection Using Machine Learning and Sentinel-2 Data

2024

Comparing K-means and Random Forest for wildfire mapping in Alpes-Côte d'Azur

Developed a Random Forest model achieving 96% accuracy to estimate burnt areas, demonstrating its superiority over K-means for precise post-fire assessment.

AUPE RiskMonitor 1.0.0: Landslide Risk Analysis Tool

2024

Visualizing landslide risks across Lombardy using ISPRA IdroGEO data

Developed to assist users in analyzing provincial landslide risks, with installation instructions and a comprehensive guide for efficient software use.