MUHAMMAD HASNAIN

GIS Analyst | Climate Modeler | Geo-AI Developer

Islamabad, Pakistan | +92 311 5148833 | ranahasnain061@gmail.com
Portfolio: hasnain061-ai.github.io
Date of birth: 08/09/2001 | Nationality: Pakistani

PROFESSIONAL SUMMARY

Geoinformatics graduate (BS, CGPA 3.73) working at the National Disaster Management Authority (NDMA) Pakistan, building its Cloud-based Early Warning System, with earlier experience at the Pakistan Meteorological Department, Geo Mapping Solutions and the Senate of Pakistan. Conducted five independent national-scale research projects on heatwaves, drought, flash drought and land-use change across Pakistan. Builds Agentic AI web portals for heatwave, flood, drought, ocean climate, coastal hazard and crop water monitoring. Proficient in ArcGIS Pro, QGIS, Google Earth Engine, Python and DSSAT, and applies machine learning and LLM-based tools to climate and environmental problems.

SKILLS

- **GIS & Remote Sensing:** ArcGIS Pro, QGIS, ENVI, Google Earth Engine, Pix4Dmapper, multispectral and hyperspectral image processing, geodatabase design, cartography, spatial analysis
- **Climate & Crop Modeling:** DSSAT, CDO (Climate Data Operators), GrADS, drought indices, heatwave analysis, bias correction of forecasts, rainfall forecasting
- **Programming & Data:** Python, R, data analysis, process automation, technical writing, Microsoft Office
- **AI & Machine Learning:** Machine learning for Earth observation, GeoAI, LLM-based tools, Agentic AI, Roboflow (image annotation)
- **Web Development:** Frontend and backend development (FastAPI), web mapping with Leaflet, Mapbox GL JS and CesiumJS (3D)

EXPERIENCE

Full-time Employee - National Disaster Management Authority (NDMA) Pakistan
Islamabad, Pakistan | Jul 2026 - present

- Building the NDMA Cloud-based Early Warning System: forecasts from seven weather models, with flood, drought, crop water and heatwave modules on one map, a FastAPI backend and an AI briefing assistant.
- Built Heatwave Intelligence, a standalone portal with 45 years of PMD station data, trend analysis, a 7-day heatwave outlook and a chat agent in English and Roman Urdu.
- Bias-corrected the 7-day heatwave outlook to 111 PMD stations; tested on July-August 2026, it caught 80% of observed heatwave days.
- Built Ocean Intelligence, a portal on acidification, warming, marine heatwaves and low oxygen in Pakistan's seas, with an outlook to 2050.
- Developing a Heatwave and Flood Digital Twin: a 3D model of a real neighbourhood showing exposure and vulnerability, building by building (prototype).

Intern - Senate of Pakistan (Parliament House)
Islamabad, Pakistan | Jan 2026 - Jun 2026

- Developed a Python tool that automated payment processing previously done manually in Excel.
- Reduced payment calculation time from hours to seconds.
- Improved the accuracy and efficiency of financial operations.

Image Annotator (part-time) - TerraSkyAI Inc.
Remote | Jul 2025 - present

- Label and annotate image data used to train and evaluate computer vision models.
- Perform satellite image stacking (multi-band and multi-temporal) to prepare imagery for analysis and annotation.
- Perform drone imagery mosaicking to produce seamless image mosaics for annotation and model training.

Meteorology Intern - Pakistan Meteorological Department
Islamabad, Pakistan | 2025 (3 months)

- Developed an integrated Python model for drought mapping across Pakistan.
- Applied multiple drought indices for national-scale drought assessment.
- Automated drought analysis that was previously calculated manually.

Meteorology Intern - Pakistan Meteorological Department
Islamabad, Pakistan | 2024 (3 months)

- Analyzed satellite data for climate forecasting and extreme weather reports.
- Developed an Android application that helps farmers analyze crop patterns.
- Developed an integrated rainfall pattern prediction model using Python and forecasting models.

GIS Analyst - Geo Mapping Solutions Pvt Ltd
Islamabad, Pakistan | 2023 (1 year)

- Processed multispectral and hyperspectral imagery and interpreted remote sensing data.
- Georeferenced Mussavi (land revenue) sheets on satellite imagery and digitized parcel-level vector layers.
- Developed and managed geodatabases, including topological correction and data validation.
- Performed query-based spatial analysis and spatial data processing.
- Produced cartographic and thematic maps and implemented project work plans.

GEO-AI PROJECTS

- Heatwave Intelligence (Agentic AI) web portal for NDMA
- Ocean Intelligence web portal on Pakistan's ocean climate for NDMA
- Heatwave and Flood Digital Twin (3D, exposure and vulnerability) for NDMA, in development
- Flood Inundation Monitoring (Agentic AI) web portal for NDMA
- Drought Monitoring (Agentic AI) web portal for PMD
- Crop Water Requirement web portal for NDMA
- Coastal Hazard web portal for NDMA
- Site Selection for Real Estate using Machine Learning
- Network Analysis for Ohio County (USA) and Germany using Python

Demos and screens: hasnain061-ai.github.io

RESEARCH PROJECTS

- Localized Changes in Heatwave Dynamics Across Pakistan and Large-Scale Climate Patterns
- Assessing the Role of Heatwaves in Triggering Flash Droughts Across Pakistan Using Remote Sensing Indicators
- Advanced Integration of Drought Mapping Using Multiple Drought Indices Across Pakistan
- Mapping and Monitoring of LULC Change and Potential Causal Factors of Climate Change in the Pothohar Region, Pakistan, Using Multi-Temporal Satellite Data and GIS
- Decision Support System for Farmers Based on Agro-Climatic Regions of Pakistan (Android application)

EDUCATION

BS Geoinformatics - PMAS Arid Agriculture University, Rawalpindi, Pakistan
2022 - 2026 | Completed April 2026 | CGPA: 3.73

CERTIFICATIONS

- Strengthening Climate Adaptation and Resilience - UNITAR / UN CC:Learn
- Becoming a Climate Champion - UNITAR / United Nations
- Flood Hazard and Exposure Mapping - UNESCO
- Introduction to Machine Learning for Earth Observation - EO College
- Cartography - Esri
- Going Places with Spatial Analysis - Esri
- Ortho-rectification of Aerial Imagery through Orthophoto.io - GEO University
- Career Essentials in Generative AI - Microsoft and LinkedIn
- Career Essentials in Data Analysis - Microsoft and LinkedIn
- Introduction to Artificial Intelligence - LinkedIn Learning

TRAINING & VOLUNTEERING

- **Workshops:** International DSSAT Workshop for Crop Modeling; Disaster Management Training (Early Warning Alerts); AGRISAT Satellite Data Training Workshop
- **Volunteering:** Pakistan Minerals Investment Forum 2025; Pakistan Learning Festival (PLF); Human Rights Commission of Pakistan (HRCP); Federal Ministry of Education (DWE)

LANGUAGES

English: Professional - C1 (listening, reading, writing), B2 (speaking) | **German:** Beginner - A1 | **Urdu:** Native

REFERENCE

Dr Shahzada Adnan
Deputy Director, Pakistan Meteorological Department, Islamabad
Contact details available on request.