MUHAMMAD USMAN LIAQAT

Date of birth: 09/10/1991

ABOUT ME

As an engineer, modeler and data analyst having 5 years of hands-on experience, I am keen eager to learn and work on automated hydrological modeling applications, extreme events (floods and droughts), remote sensing and optimization techniques to manage water resources and reduce water –related disaster risks under climate change.
Research Interests:
Hydrology |Remote Sensing & GIS | Floods and Droughts| EO Data Analyst| Nature Based Solutions | Impact Assessment |Machine Learning|
I am competent in performing:

- Hydrologic analysis; Flood and drought hazard mapping using data driven, process-based modeling and big data.
- Hands-on experience with different gridded climatic and remote sensing datasets
- CORDEX WAS (44 and 22) and CMIP6
- The design of geospatial sampling methods and the mapping of data regarding climate, soil, land use, and land cover using remote sensing and GIS applications.
- Water quality modeling using remote sensing and machine learning.
- Project administration and management skills including proposal preparation, scheduling, writing deliverables, quality assurance and coordinating with the internal team.

EDUCATION AND TRAINING

26/01/2019 – 10/01/2023 Brescia, Italy
PHD (CIVIL, ENVIRONMENTAL ENGINEERING, INTERNATIONAL COOPERATION AND MATHEMATICS) University of Brescia

Supervisor: Prof. Roberto Ranzi

Address 25123, Brescia, Italy | **Field of study** Natural Risk Assesment and Management |

Thesis Evaluation of the effect of climate variability on the hydro-glaciological regime in the Upper Indus Basin

Link https://hdl.handle.net/11379/5683849

21/09/2013 – 31/12/2015 Faisalabad, Pakistan
MSC(HONS) AGRICULTURAL ENGINEERING University of Agricultural,Faisalabad

Supervisor : **Prof. Jehanzeb Masud Cheema**

Field of study Remote Sensing in Water Resources Management | **Final grade** 3.47/4.00 | **Level in EQF** EQF level 3 |

Thesis Intercomparision of Satellitle Imagery to Estimate Crop Yield in the Irrigated Indus Basin

WORK EXPERIENCE

06/02/2023 – 06/02/2024 Bolzano, Italy
POST-DOC RESEARCHER EURAC RESEARCH, INSTITUTE FOR EARTH OBSERVATION

- Development of Drought Early Warming System for the Alps using Hydrological Modeling and Machine Learning
- Performing research in surrogate model of hydrological using GPU's. The model is implemented in python programming language using pytorch so that simulations can be run on graphics processing units, guaranteeingfast execution time even for high-resolution meshes and large catchments and spatial extents.
- Update hydrological data using data parsing on Alpine Drought Observatory (ADO) Server

Website https://www.eurac.edu/en/institutes-centers/institute-for-earth-observation

01/04/2022 – 31/01/2023 Brescia, Italy
RESEARCH ASSISTANT UNIVERSITY OF BRESCIA

- Effects of climate change on flood flows in a mountain environment, Italy.
- Geospatial sampling design and GIS mapping of climate, soil, land use, and land cover data for the PO River Basin.

01/10/2021 – 31/12/2021 Santander, Spain
ERASMUS TRAINEESHIP UNIVERSITY DE CANTABRIA

- Climate Change Projections of Extreme Wet and Dry Events in the Upper Jhelum Basin Using a Multivariate Drought Index: (i.e., standardized precipitation evapotranspiration index – SPEI).
- Bias correction using univariate and multivariate methods

25/01/2017 – 29/12/2018 Al Ain, United Arab Emirates
RESEARCH ASSISTANT UAE UNIVERSITY

National Center Based Research Grant (31R093-Research Center-NWC-2-2016) "Transboundary Groundwater Resources in the UAE". The major responsibilities in this project:

- Quantify impact of land cover changes using remote sensing and GIS applications on ground water resources in the Al-Ain region.
- Write a comprehensive review paper on water resources availability, sustainability and challenges in the GCC countries.
- Exaimne groundwater vulnerability using GIS and Machine Learning (RF and SVM)
- Team member in field surveys conducted in Al Khatim, Al-Ain and Remah for collection of groundwater samples and water table

13/11/2014 – 30/12/2016 Faisalabad, Pakistan
RESAERCH ASSOCIATE UNIVERSITY OF AGRICULTURE

Key Responsibilities:
1) IFPRI-PSSP CGP Grant 470 "Assessment of water allocations using remote sensing and GIS modeling for Indus Basin, Pakistan".

- Performed object-based analysis and supervised classification for land use and land cover classification on the irrigated Indus Basin using hyperspectral and multispectral data.
- Crop yield mapping using multiple vegetation indices (NDVI, EVI, SAVI) in the Irrigated Indus Basin.
- Spatially map effective evapotranspiration at 250 m pixel information from the MODIS satellite and estimate water productivity for wheat and rice crops.
- Graduate Teaching Assistant for ID 712, Remote Sensing and GIS for Water Resources Management.
- Team member in field surveys conducted in Punjab and Khyber Pkhtunkhwa for ground truthing analysis of remotely sensed data.

2) Team Member in projects entitled "Strategic Indus Basin Assesment in Pakistan" to monitor Hydrological Parameters and Groundwater Changes in Irrigated Indus Basin Pakistan funded by Commonwealth Scientific and Industrial Research Organization (CSIRO), Australia

DIGITAL SKILLS

R | Python | QGIS 2.18.14 | CDO | Physical Based Distributed Snow Ice land Mode | Linux | Wflow,HydroMT | ArcGIS 10.8 | LaTeX | Copernicus Climate Data Store | Intermediate Deep Learning (Pytorch Keras) | EO Cloud Environment | Image processing skills in remote sensed data (experience in Sentinel, Landsat, and Modis data) | Hydrological Modelling (SWAT, HBV, HEC-HMS)

ADDITIONAL INFORMATION

PUBLICATIONS

Journal Publications

1) **Liaqat, M.U.** Ranzi R (2023) Energy Balance Modelling of Snow and Ice Melt in the Naltar Catchment, Upper Indus Basin, Journal of Hydrology (Under Review).
2) **Liaqat MU**, Grossi G, Casanueva A, Ranzi R (2023) Energy balance modelling of snow and ice melt for the Naltar Catchment Pakistan in the Future Climate, Journal of Hydrology (**Accepted with revision**).
3) Sherif M, **Liaqat MU**, Baig F, Al-Rashed M (2023) Water resources availability, sustainability and challenges in the GCC countries: An overview. Heliyon. 2023 Sep 29;9(10):e20543. doi: 10.1016/j.heliyon.2023.e20543.
4) Ansari, R., Casanueva, A., **Liaqat, M.U**. and Grossi, G., 2023. Evaluation of bias correction methods for a multivariate drought index: case study of the Upper Jhelum Basin. Geoscientific Model Development, 16(7), pp.2055-2076.
5) **Liaqat MU**, Grossi G, Hasson Su, Ranzi R (2022) Characterization of interannual and seasonal variability of hydro-climatic trends in the Upper Indus Basin Theoretical and Applied Climatology doi:10.1007/ s00704-021-03850-3
6) Ansari, R., **Liaqat MU**, Grossi G. 2022. Evaluation of gridded datasets for terrestrial water budget assessment in the Upper Jhelum River Basin-South Asia. Journal of Hydrology, 613, p.128294.
7) Hanif, M.F., Mustafa, M.R.U., **Liaqat, M.U.**, Hashim, A.M. and Yusof, K.W., 2022. Evaluation of Long-Term Trends of Rainfall in Perak, Malaysia. Climate, 10(3), p.44.
8)Khan, Q., **Liaqat, M.U**., Mohamed, M.M.2021. A comparative assessment of modeling groundwater vulnerability using DRASTIC method from GIS and a novel classification method using Machine Learning classifiers. Geo Carta International.
9) **Liaqat, M.U**., Mohamed, M.M., Chowdhury, R., Elmahdy, S.I., Khan, Q. and Ansari, R., 2021. Impact of Land Use/Land Cover Changes on Ground Water Resources in Al Ain Region of the United Arab Emirates Using Remote Sensing and GIS Techniques. Groundwater for Sustainable Development, p.100587.
10) Hussein, K., Alkaabi, K., Ghebreyesus, D., **Liaqat, M.U**. and Sharif, H.O., 2020. Land use/land cover

change along the Eastern Coast of the UAE and its impact on flooding risk. Geomatics, Natural Hazards and Risk, 11(1), pp.112-130.
11) **Liaqat, M. U**, Cheema, M.J.M., Huang, W., Mahmood, T. 2017. Evaluation of MODIS and LANDSAT Multiband Vegetation Indices Used for Wheat Yield Estimation in Irrigated Indus Basin. Computer and Electronics in Agriculture. Computers and Electronics in Agriculture. 138:39–47.
12) Cheema, M.J.M., Bakhsh, A., Mahmood, T and **Liaqat, M.U**. 2016. Assessment of Water Allocations using Remote Sensing and GIS Modeling for Indus Basin, Pakistan. WORKING PAPER No. 036.International Food Policy Research Institute.

Deliverable – 2023

1) **Liaqat M.U**., Castelli M., Elia D., Accarino G., Donno D., Fiore M.,Backeberg B., Schramm M., Pagé C., Groen F.D., Weerts A., Roscoe K., and Nasser A. (2023). interTwin D4.1 First Architecture design of the DTs capabilities for climate change and impact decision support tools (1 Under EC review). Zenodo. https://doi.org/10.5281/zenodo.8321307

Conference Publications

Conference Publications
1) Amer, A., **Liaqat, M.U.**, Jacob, A., Liotta, A. A Novel Surrogate-Based Deep Learning Model Fusion for Daily Actual Evapotranspiration Prediction Applied in Adige Catchment, Italy, IGARSS 7-12 July 2024, Athens Greece.
2) **Liaqat, M.U**., Alasaweda, M.H., Weerts, A., Crespi, A., Dhinakaran, S., Jacob,A., Casteli, M.2023. Development of Drought Early Warning System for the Alps, Big Data in Space, November 2023, Austria https://dx.doi.org/10.2760/46796
3) **Liaqat MU**, Ranzi R (2022) Simulating the Hydrological Regimes of the Snow fed and Glacierized Naltar Catchment (Pakistan) Using a Distributed Energy Balance Model, International Association for Hydro-Environment Engineering and Research,(19-24 June, 2022) Spain
4) **Liaqat, M.U**., Casanueva, A., Grossi, G. and Ranzi, R., 2022. Future climate and runoff projections in the Naltar Catchment, Upper Indus Basin from CORDEX-South Asia regional climate models and hydrological modelling (No. EGU22-6030). Copernicus Meetings.
5) **Liaqat, M.U.**, Casanueva, A., Grossi, G. and Ranzi, R., 2022.Hydrological Response to Climate change under CORDEX-South Asia Experiments in Western Karakoram, Upper Indus Basin, International Conference on Water Resources Management and Sustainability: Solutions for Arid Regions, Dubai, UAE, March 22-24, 2022.
6) **Liaqat, M.U**., Grossi, G., Ansari, R. and Ranzi, R., 2021, December. Modeling Hydrological Vulnerability to Climate Change in the Glacierized Naltar Catchment (Pakistan) Using a Distributed Energy Balance Model. In AGU Fall Meeting 2021. USA.
7) **Liaqat, M.U**., Grossi, G. and Ranzi, R., 2021. Evaluation of Snow Melt Progression in Karakorum Using Distributed Energy Balance Modeling for flood prediction, Le giornate dell'Idrologia 2021, Naples, Italy.
8) **Liaqat, M.U**., Ranzi, R., Grossi, G., and Mahmood, T., "Characterization of Interannual and Seasonal Variability of Hydro-Climatic Trends in the Upper Indus Basin", 2020. doi:10.5194/egusphere-egu2020-5867.
9) Pini, M., Scalvini, A., **Liaqat, M.U**., Ranzi, R., Serina, I. and Mehmood, T., 2020. Evaluation of Machine Learning Techniques for Inflow Prediction in Lake Como, Italy. Procedia Computer Science, 176, pp.918-927.
10) **Liaqat, M.U**., Chowdhury, R.K. 2017. Monitoring urban growth and land use land cover change in al AIN, UAE using remote sensing and GIS techniques. 4th International Conference on Engineering Geophysics (ICEG). Al Ain, UAE. https://doi.org/10.1190/iceg2017-044.

NETWORKS AND MEMBERSHIPS

Memberships

1. American Geophysical Union
2. European Geophysical Union
3. Italian Hydrological Society
4. Asian Remote Sensing Association
5. Pakistan Engineering Council Islamabad (AGR/2791)

CONFERENCES AND SEMINARS

Courses, seminars, conferences and workshops I have benefited enormously from attending valuable courses
Courses
1) GEOframe Winter School GWS2021, 7 - 16 January 2021.
2) IS-ENES3 Virtual Spring School on Climate data use for impact assessments, (from 2 March to 16 April 2021).
3) 12th Annual Catchment Science Summer School University, 29 August-3 September 2021, University of Birmingham, UK
4) Big Data analytics for water-related applications
Seminars, conferences and workshops
1) Large-Scale Changes in Hydrological Characteristics, 6-April 2022
2) WCRP South Asian Climate Research Forum, November 30, 2021.
3) Hydrology Days 2021, Naples, Italy.
4) American Geophysical Union, Fall Meeting, December 17-21, 2021
5) Skill Hub: PhD Talent Day, 01-April 2022
6) From the Alps to the Karakorum: climate variability and water resources for agriculture, DICATAM, Brescia, 11 July 2022.
7) AI4Copernicus SummerSchool 2023, Luxembourg Institute of Science and Technology (LIST), Luxembourg
8) Linear Algebra for Machine Learning and Data Science, July 2023, Coursera.
9) Sequences, Time Series and Prediction, August, 2023, Coursera.

10) Methods and Practices for Trustworthy and Ethical AI, 29 Sep 2023, EURAC Research, Italy

MANAGEMENT AND LEADERSHIP SKILLS

Mediator for Signing MOU between Higher Education Commission Pakistan and University of Brescia, Italy It is privilege for me that I was one of team member who provided services as a mediator between University of Brescia and Higher Education Commission, Pakistan (HEC). HEC recently signed "Memorandum of Understanding with University of Brescia, Italy for Scientific Collaboration". By signing this MOU, it became second university of Italy where students can come for a higher studies at all levels through HEC Overseas Scholarship Program.

ORGANISATIONAL SKILLS Mediator between Battistini Vivai, Italy and Trade Development Authority Pakistan Recently I also worked as Mediator among Battistini Vivai, Italy,The Government of Gilgit-Baltistan and Trade Development Authority Pakistan to setup pilot project for Apple and bluberry varieties in Kharmang, Gilgit Baltistan region.