

# Supath Dhital, MS

The University of Alabama

Department of Geography and the Environment

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## PROFESSIONAL SUMMARY

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A geospatial data specialist and hydrologist experienced in flood prediction systems combining AI with physics-based models. An open-source advocate creating accessible, reproducible scientific tools. Skilled in developing scalable frameworks for water management, disaster preparedness, and climate resilience globally. Experienced in geospatial data engineering, model development, benchmarking, and dissemination. Notably, researchers, NOAA, and federal agencies have adopted advanced flood-inundation modeling tools that I have led in developing to improve flood forecasting and response.

## RESEARCH FOCUS/AREA

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- Terrestrial Hydrology
- Surrogate Modeling and AI in Water Science
- Operational Flood Forecasting Systems
- GIScience for Decision Support Systems and Disaster Preparedness
- Geospatial Big Data Processing for Hydrology
- Large-Scale Operational Frameworks / Scientific Programming

## EDUCATION

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**MS in Geography and the Environment**, The University of Alabama, Tuscaloosa, AL Jan 2024 - Dec 2025

- **Thesis title:** Enhancement of low-fidelity flood inundation mapping through surrogate modeling.  
Advisor: Dr. **Sagy Cohen**
- **Relevant coursework:** Process hydrology, Environmental data analysis, GIS programming, DBMS (PostGIS), WebGIS, Quantitative Methods [**GPA: 4.0/4.0**]

**BE in Geomatics**, Institute of Engineering, Tribhuvan University, Nepal Nov 2018 – Apr 2023

- **Undergraduate thesis title:** Short-term weather forecasting by using Long Short-Term Memory (LSTM) deep learning approach: A study of Kaski district, Nepal
- **Relevant Coursework:** Environment modeling, Remote Sensing, C, C++, GIS, Surveying I & II, Photogrammetry, Geodesy I & II, Digital Terrain Model, Applied physics, Statistics, Mathematics I-IV [**Percentage: 72.63/100**]

## RESEARCH APPOINTMENTS

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**Geography Researcher II**, Surface Dynamics Modeling Lab, UA, Tuscaloosa, AL Jan 2026 - Present

Supervisor: Dr. **Sagy Cohen**

- **Leading FIMbox development-** A modular open-source testbed for Flood Inundation Mapping (FIM) enables researchers to run simulations with custom datasets and parameters. As a Python library, it offers standardized APIs, integrates geospatial data, supports hypothesis testing, and has extensive features documentation.
- **Facilitated cross-institutional collaboration** between NOAA Office of Water Prediction (OWP), CIROH, CUAHSI, and academic researchers by delivering technical workshops, peer-reviewed publications, and comprehensive documentation. This effort led to FIMbox's adoption across many institutions and its integration into research, NOAA's operations, and more.

**Graduate Research Assistant**, Surface Dynamics Modeling Lab, UA, Tuscaloosa, AL Jan 2024 - Dec 2025

Advisor: Dr. **Sagy Cohen**

- **Developed a hybrid AI surrogate model** that increased flood inundation accuracy by 35% and accelerated processes over 10,000 times by combining deep learning with physics-based HEC-RAS simulations. Validated at 20+ U.S. sites, it formed a scalable framework ([https://github.com/sdmlua/FIMserv/tree/main/src/fimserve/enhancement\\_withSM](https://github.com/sdmlua/FIMserv/tree/main/src/fimserve/enhancement_withSM)) that was integrated into NOAA's OWP, enabling efficient flood prediction across 2.7 million river reaches.
- **Led the development of FIMserv**, A Python tool (<https://github.com/sdmlua/FIMserv>) generates Flood Inundation Mapping across the U.S. using NOAA OWP HAND-based framework. It made national flood forecasting more accessible, with over 40,000 downloads and adoption by NOAA OWP's National Water Center for emergencies.
- **Developed the FIMEval flood evaluation toolkit** (<https://github.com/sdmlua/fimeval>) and established quality assurance for flood models by contributing to the FIMEval framework development, and is connected with the **FIM Benchmark Database (FIMbench)** with over **200 real and synthetic events**. This offers researchers, agencies, and modelers standardized methods for validating flood predictions, along with technical documentation and a web platform for database access and API use.
- **Collaborated on river-slope attribution using ICESat-2 for the United States**, adopted by NOAA Office of Water Prediction (OWP) for the operational HAND-based FIM model, which improves FIM accuracy by up to 31%, supporting national-scale hydrography integration efforts.
- **Collaborated on analyzing the spatio-temporal variability of river slopes using Surface Water Ocean Topography (SWOT)** products globally and produced a high-resolution temporal slope dataset that serves as a foundational resource for hydrological modeling globally.
- **Architected a spatial joining framework, RiverJoin** (<https://github.com/sdmlua/RiverJoin>), for joining the different hydrography-based river flowlines for bidirectional attribute sharing, allowing the use of the remote sensing-based high-resolution products.
- **Co-led 2 training workshops on CIROH Developers Conference 2025** on FIM generation using the US national hydrological forecasting framework and evaluation framework using an extensive benchmark database (<https://ciroh.ua.edu/devconference/2025-ciroh-developers-conference/flood-inundation-mapping/>) for 100+ water resources professionals.

**Water Prediction Innovators Summer Institute Fellow**, CUAHSI, Tuscaloosa, AL

Jun - Jul 2025

Mentor: Dr. **Jonathan M. Frame** and Dr. **Marouane Temimi**

- **Novel representation of Pluvial (Urban) Flooding within NOAA's Water Modeling Framework** by creating Pluvial Flood Indices (PFI-1/PFI-2) using hydrological modeling results; filling a key gap in the operational handling of pluvial flooding.
- **Validated Pluvial Flooding Indices detection capabilities** by implementing and testing indices across 595 flood events in 251 catchments nationwide, demonstrating robust performance and identifying urbanization as the primary control factor.
- **Contributed to NOAA's next-generation water prediction infrastructure** by integrating pluvial flooding physics into the CFE baseline model, enhancing forecast capabilities for flash flooding that poses the greatest risk to urban communities

## **OPEN-SOURCE SCIENTIFIC SOFTWARE, TOOL, DATA PRODUCTS**

All tools and datasets are open-source, publicly available, and widely used by researchers, agencies, government bodies, and emergency professionals for research and emergency response.

**(i) Software and Tools**

- **FIMbox** (Ongoing)- Modular testbed for generating and comparing FIM simulations with configurable inputs for research-to-operations workflows
  - **GitHub-** <https://github.com/sdmlua/fimbox>
- **FIM as a Service- FIMserv** (40,000+ Downloads)- Modular Flood Inundation Mapping Testbed Platform
  - **GitHub-** <https://github.com/sdmlua/FIMserv>
  - **Python Package-** <https://pypi.org/project/fimserve/>
  - **Documentation-** <https://docs.ciroh.org/docs/products/community-fim/fimserve/>
  - **Award- Thomas Graziano Research to Operations award** during CIROH Science Meeting 2025 – [More Info](#)
- **FIM Evaluation Framework- FIMEval** (15,000+ Downloads) - Evaluation framework for flood-inundation predictions across benchmark databases
  - **GitHub-** <https://github.com/sdmlua/fimeval>
  - **Python Package-** <https://pypi.org/project/fimeval/>
  - **Documentation-** <https://docs.ciroh.org/docs/products/community-fim/fimeval/>
- **RiverJoin-** Framework for spatially joining river flowlines from different hydrographic datasets (NHDPlus, MERIT Hydro, etc.) for data translation bidirectionally.
  - **GitHub-** <https://github.com/sdmlua/RiverJoin>
- **Microsoft Building Footprint Extractor- msfootprint** (11,000+ Downloads)- A Python package for extracting Microsoft's global building footprints based on user-defined boundaries
  - **GitHub-** <https://github.com/supathdhitalGEO/msfootprint>
  - **Python Package-** <https://pypi.org/project/msfootprint/>
  - **Documentation-** <https://zenodo.org/records/14597326>
- **Evacuation Framework-** a framework for emergency evacuation planning using demographic, geographical, and open-source road data during the floods.
  - **GitHub-** [https://github.com/supathdhitalGEO/evacuation\\_framework](https://github.com/supathdhitalGEO/evacuation_framework)

**(ii) Datasets**

- **FIM Benchmark Repository- FIMbench** - Benchmark database and associated tooling for multi-tier flood-inundation products enabling large-scale comparative evaluation
  - **GitHub-** <https://github.com/sdmlua/fimbench>
  - **Multitier Database Hosted in AWS S3-** [https://sdmlab.ciroh.org/index.html#FIM\\_Database/](https://sdmlab.ciroh.org/index.html#FIM_Database/)
  - **FIMbench Interactive Webpage-** <https://fimbench.streamlit.app>
- **Improved Slope Dataset for US Operational Flood Inundation Mapping**
  - **Dataset in Zenodo (450+ Downloads)-** <https://zenodo.org/records/17886466>
  - **Award- Thomas Graziano Research to Operations award** during the CIROH Science Meeting 2025 – [More Info](#)
  - **Media Coverage-** Alabama Water Institute, The University of Alabama- <https://awi.ua.edu/2025/09/26/new-satellite-derived-river-slope-database-helps-improves-u-s-flood-forecasts/>
- **Global Monthly Reach-Level Water Surface Slopes from SWOT**
  - **Dataset in Zenodo-** <https://zenodo.org/records/17926443>
  - **GitHub-** <https://github.com/sdmlua/DynamicSWOTslope>
- **Pluvial Flooding dataset for CONUS**
  - **Dataset in Hydro Share-** <https://www.hydroshare.org/resource/a20de1de8cdf4c5197f46319cb911242/>

- **GitHub-** <https://github.com/NWC-CUAHSI-Summer-Institute/hydropulse>

## **PUBLICATIONS** [status written if under review or in preparation]

- Dhital, S.**, 2025. Enhancement of Low-Fidelity Flood Inundation Mapping Through Surrogate Modeling. *The University of Alabama-ProQuest*.
- Devi, D., **Dhital, S.**, Munasinghe, D., Cohen, S., Baruah, A., Chen, Y., Tian, D., and Pruitt, C., 2025. A Framework for the Evaluation of Flood Inundation Predictions Over Extensive Benchmark Databases. *Environmental Modeling & Software*. <https://doi.org/10.1016/j.envsoft.2025.106786>
- Baruah, A., Hinge, G., **Dhital, S.**, Kilicarslan, B., and Wani, O., 2025, Flooding, nonlinear scaling, and Jensen's inequality: Analyzing changes in inundation extent with river discharge nonstationarity. *Advances in Water Resources*, p.105170 <https://doi.org/10.1016/j.advwatres.2025.105170>
- Chen, Y., Cohen, S., Baruah, A., Devi, D., **Dhital, S.**, Tian, D., and Munasinghe, D. 2025. Merging Remote Sensing Derived River Slope Datasets with High-Resolution Hydro fabrics for the United States. *Scientific Data*, 12(1), p.1657. <https://doi.org/10.1038/s41597-025-05941-6>
- Bhattacharai, Y., **Dhital, S.**, Sauda, S.S., Abdelkader, M., and Frame, J.M., 2025. Towards Representing Pluvial Flooding within NOAA's NextGen Modeling Framework. *Technical Report, CUAHSI Water Prediction Innovators Summer Institute 2025*, p.35. <https://doi.org/10.13140/RG.2.2.28258.39360>
- Baruah, A., **Dhital, S.**, Cohen, S., Tran, T.N.D., Elhaddad, H., Watts, C.L., Devi, D., Chen, Y., and Pruitt, C., 2025. FIMserv v. 1.0: A tool for streamlining Flood Inundation Mapping (FIM) using the United States operational hydrological forecasting framework. *Environmental Modelling & Software*, p.106581. <https://doi.org/10.1016/j.envsoft.2025.106581>
- Dhital, S.** 2024. Methods to improve run time of hydrologic models: opportunities and challenges in the machine learning era. *arXiv preprint*, <https://doi.org/10.48550/arXiv.2408.02242>
- Dhital, S.**, Lamsal, K., Shrestha, S. and Bhurtyal, U., 2024. Forecasting Weather using Deep Learning from the Meteorological Stations Data: A Study of Different Meteorological Stations in Kaski District, Nepal. *Eurasian J. Sci. Eng.*, 10(2),16-33. <https://doi.org/10.23918/eajse.v10i2p02>
- Dhital, S.** and Lamsal, K., 2023. Orthophoto Generation Using UAV: A Case Study of Pashchimanchal Campus, Pokhara. *Geospace*, Vol III, 8-12.
- Dhital, S.**, Cohen, S., Nikrou, P., Baruah, A., Chen, Y., Munasinghe, D., and Devi, D., 2025. Enhancement of low-fidelity flood inundation mapping through surrogate modeling. *Water Resources Research*. [status: submitted]
- Dhital, S.**, Adhikari, A., and Pokhrel, S., 2024. Exploring Seasonal Dynamics of Landsat 8 and 9 Data on Vegetation Indices in the Mountainous Regions of Nepal. *Journal of the Indian Society of Remote Sensing*. <https://doi.org/10.22541/au.175043663.34927353/v1> [status: revision submitted]
- Chen, Y., **Dhital, S.**, Cohen, S., Baruah, A., and Devi, D., Global-Scale Analysis of River Slope Monthly Variation Based on the SWOT River Vector Data Products. *Geophysical Research Letters*. 10.22541/essoar.176659889.96691731/v1 [status submitted]
- Chen, Y., **Dhital, S.**, Cohen, S., Baruah, A., Devi, D., and Munasinghe, D., A Framework for Spatially Joining River Flowlines across Hydrographic Datasets to Enable Bidirectional Data Transfer [status: in prep for *WRR*]

Devi, D., **Dhital, S.**, Munasinghe, D., Tian, D., Cohen, S., Baruah, A., Chen, Y. and Nikrou, P., FIMbench: A Benchmark Database of Multi-Tier Flood Inundation Maps for Large-Scale Evaluation. [status: in prep for *Scientific Data*]

Haque, M.M., Shao, W., **Dhital, S.**, and Li, D., Assessing Infrastructure Vulnerability and Evacuation Routes to Flooding Using Spatial Database Management: A Case Study of City of Mobile, Alabama. [status: in prep]

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### CONFERENCES [list as leading and following by a contributing author-based presentation]

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**Dhital, S.**, Cohen, S., Nikrou, P., Baruah, A., Chen, Y., Munasinghe, D., and Devi, D. (May 2026). Enhancement of low-fidelity operational flood inundation mapping through surrogate modeling. *Community Surface Dynamics Modeling System (CSDMS) 2026*, Minneapolis, MN.

**Dhital, S.**, Baruah, A., Nikrou, P., and Cohen, S. (December 2025). Convolutional Neural Network Surrogate Modeling of Flood Inundation Predictions for the United States Operational Hydrological Forecasting Framework. *American Geophysical Union (AGU) 2025*, New Orleans, LA.

**Dhital, S.**, Baruah, A., Nikrou, P., and Cohen, S. (May 2025). Towards post-processing enhancement of NOAA operational Flood Inundation Mapping (OWP HAND-FIM) through Surrogate Modeling. *CIROH Developers Conference 2025*, Burlington, VT.

**Dhital, S.**, Baruah, A., Nikrou, P., and Cohen, S. (December 2024). Enhancement of the NOAA Flood Inundation Mapping Framework (OWP HAND-FIM) through Surrogate Modeling. *American Geophysical Union (AGU) 2024*, Washington, D.C.

**Dhital, S.**, Baruah, A., Nikrou, P., and Cohen, S. (September 2024). A surrogate modeling approach for the enhancement of the NOAA operational Flood Inundation Mapping framework (OWP HAND-FIM). *Alabama Water Resources Conference (ALWRC)*, Orange Beach, AL.

**Dhital, S.**, Baruah, A., Nikrou, P., and Cohen, S. (May 2024). A Detailed Comparison between OWP HAND-FIM and HEC-RAS Predictions. *CIROH Developers Conference 2024*, Salt Lake City, Utah.

Cohen, S., Devi, D., Munasinghe, D., Baruah, A., Tian, D., **Dhital, S.**, and Liu, H. (December 2025). Toward Robust Large-scale Evaluations of Flood Inundation Predictions. *American Geophysical Union (AGU) 2025*, New Orleans, LA.

Chen, Y., **Dhital, S.**, Cohen, S., Baruah, A., and Devi, D. (December 2025). Global-Scale Analysis of River Slope Monthly Variation Based on the SWOT River Vector Data Product. *American Geophysical Union (AGU) 2025*, New Orleans, LA.

Baruah, A., **Dhital, S.**, Cohen, S., Tran, T.N.D., Elhaddad, H., Watts, C.L., Devi, D., Chen, Y., and Pruitt, C. (December 2025). FIMserv v.1.0: A Tool for Streamlining Flood Inundation Mapping (FIM) Using the United States Operational Hydrological Forecasting Framework. *American Geophysical Union (AGU) 2025*, New Orleans, LA.

Devi, D., **Dhital, S.**, Munasinghe, D., Sagy, C., Baruah, A., Chen, Y., Tian, D., and Pruitt, C. (December 2025). A Framework for the Evaluation of Flood Inundation Predictions Over Extensive Benchmark Databases. *American Geophysical Union (AGU) 2025*, New Orleans, LA.

Bhattacharai, Y., **Dhital, S.**, Sauda, S., Abdelkader, M., Frame, J.M., and Temimi, M. (December 2025). Towards Representing Pluvial Flooding within NOAA's NextGen Modeling Framework. *American Geophysical Union (AGU) 2025*, New Orleans, LA.

Haque, M.M., Shao, W., **Dhital, S.**, and Li, D. (December 2025). Assessing Infrastructure Vulnerability and Evacuation Routes to Flooding Using Spatial Database Management: A Case Study of City of Mobile, Alabama. *American Geophysical Union (AGU) 2025*, New Orleans, LA.

Baruah, A., **Dhital, S.**, Cohen, S., Tran, T.N.D., Elhaddad, H., Watts, C.L., Devi, D., Chen, Y., and Pruitt, C. (March 2025). FIMServe: A Python Package for Operational Flood Inundation Mapping across CONtiguous United States. *HEPEX Conference, The University of Alabama, 2025*, Tuscaloosa, AL

Devi, D., **Dhital, S.**, Munasinghe, D., Tian, D., Cohen, S., Baruah, A., and Chen, Y. (May 2025). Evaluating Flood Inundation Mapping Predictions Using Large-Scale Benchmark Datasets. *CIROH Developers Conference 2025*, Burlington, VT

Devi, D., **Dhital, S.**, Munasinghe, D., Baruah, A., Tian, D., Nikrou, P., and Cohen, C. (March 2025). A Python-Based Automated Framework for Evaluating Flood Inundation Mapping Predictions Across Diverse Benchmark Datasets. *HEPEX Conference, The University of Alabama, 2025*, Tuscaloosa, AL

## PROFESSIONAL WORK EXPERIENCE

**Geospatial Data Quality Intern** [remote], Humanitarian OpenStreetMap Team, Nepal Oct 2022 – Jan 2023

- Enhanced disaster response mapping by validating 70+ HOT projects in 12 countries with rigorous QA/QC, ensuring reliable geospatial data for humanitarian aid.
- Enhanced data quality standards by designing automated validation workflows and web-based mapping interfaces, reducing error rates by 40% and improving geospatial data reliability for emergency response

**Geospatial Analyst/Mapper**, Kathmandu Living Labs, Nepal Feb – Oct 2022

- Supported infrastructure planning and disaster recovery by mapping and validating river/road networks across 21 districts in Pakistan, a project **funded by the World Bank** and 15+ Nepal earthquake sites (>1,000 km<sup>2</sup>), creating critical geodatabases for government agencies and NGOs
- Accelerated post-disaster reconstruction by updating OpenStreetMap data for earthquake-affected regions using JOSM/ArcGIS workflows, enabling aid organizations to target assistance more effectively

## VOLUNTEER AND LEADERSHIP EXPERIENCE

**Junior ML Engineer** [remote], Omdena, Nepal Jan – Apr 2023

- Led deep learning flood forecasting project for Belgrade using 20+ years of Danube/Sava River data, demonstrating transferable AI methods for international flood prediction applications
- Conducted GIS-based network analysis for bat corridor conservation in Brussels, Belgium, applying geospatial expertise to biodiversity protection

**Advanced Mapper**, Humanitarian OpenStreetMap Team (HOT), Nepal 2022 – 2022

- Contributed to map edits to digitize geographical features and validated the quality of data within OpenStreetMap through 100+ HOT projects supporting disaster response in developing nations
- Trained 50+ volunteers in participatory mapping techniques, building community capacity for crisis mapping

**Executive Committee Member**, Geomatics Engineering Students' Association of Nepal (GESAN), Nepal 2021/22

- Provided training webinars to 100+ undergraduate students on mapping and validation of crowdsourced data in OpenStreetMap, Earth observation, and geoinformatics
- Organized hands-on workshops in LiDAR, DGPS, GPS, and drone surveying for professional skill development

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## HONORS, AWARDS & RECOGNITION

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- **CSDMS Best Student Modeler Award 2026 1<sup>st</sup> Runner Up (2026)**
  - Recognized among the top 2 submissions for the student modeler award in a competitive international contest by CSDMS, University of Colorado Boulder.
  - Received full travel and registration support for the CSDMS annual meeting in Minneapolis, Minnesota (\$2500 value).
- **CUAHSI Data Publishing Program (2025)- \$250**
- **Outstanding MS Research** by an Individual, Department of Geography, University of Alabama (2025)
  - Recognized for exceptional contributions to US operational flood forecasting research with national impact
- **Graduate School Funding, University of Alabama (2024-2025)- \$1000**
- **CUAHSI Water Prediction Innovators Summer Institute Fellow (2025)**
  - Competitively selected from 100+ applicants from multiple institutions in the US to advance NOAA's NextGen water prediction framework
  - Awarded with \$7500 for a 7-week program
- **Merit-Based Full Graduate Scholarship, University of Alabama (2024-2025)**
  - Awarded a \$55,000/year full tuition scholarship recognizing academic excellence and research potential
- **Global Humanitarian OpenStreetMap Team Data Quality Intern (2022)**
  - Selected as 1 of 28 global interns from 1000+ applicants for a competitive geospatial data quality program for Humanitarian Aid
- **Merit-Based Full Undergraduate Scholarship, Tribhuvan University, Nepal (2018-2023)**
  - Four-year scholarship for academic excellence in the Geomatics Engineering program

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## MEDIA COVERAGE AND OUTREACH

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- New Satellite-Derived River Slope Database Helps Improve U.S. Flood Forecasts. *Alabama Water Institute (AWI), University of Alabama*. September 26, 2025. <https://awi.ua.edu/2025/09/26/new-satellite-derived-river-slope-database-helps-improves-u-s-flood-forecasts/>
- Research Team Develops Breakthrough Tool for Flood Forecasting. *Yahoo News*. August 29, 2025. <https://www.yahoo.com/news/articles/research-team-develops-breakthrough-tool-154500807.html> (Feature on FIMserv tool based on our work, highlighting low-gradient river improvements)

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## SELECTED PROJECTS

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- **OWP HAND-FIM Automation Toolbox:** Created an ArcGIS Pro toolbox that integrates open-source Python packages to simplify flood inundation mapping and assessment across CONUS.
- **Terrain-Based Flood Model Analysis:** Compared numerical and simplified flood models for the Neuse River, NC, analyzing accuracy trade-offs in operational frameworks.
- **Benchmark Flood Database WebGIS:** Developed and deployed a web app with ArcGIS Online and JavaScript to share flood extent data from a large benchmark database.
- **Dynamic Evacuation Route Planning System:** Implemented PostgreSQL/PostGIS database with a network analysis framework for real-time flood risk evacuation route optimization based on changing flood magnitude.
- **Infrastructure Surveying with DGPS & GIS:** Conducted site surveys for topography, hydropower, and bridges using DGPS, field instruments, and GIS for precise data.
- **UAV-Based High-Resolution Mapping:** Led UAV mapping campaigns using Pix4Dmapper, GPS, Survey123, and Field Maps for topographic and infrastructure data acquisition.

- **LiDAR & DGPS 3D Georeferencing:** Processed LiDAR point clouds and DGPS coordinates in Global Mapper and Leica Infinity for accurate 3D georeferencing and elevation modeling.

### **PROFESSIONAL LICENSE AND MEMBERSHIPS**

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- American Geophysical Union (AGU) Student Membership 2024 - present
- Nepal Engineering Council License, Registration Number- 81937 2023

### **TECHNICAL SKILLS**

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**Programming Languages/Frameworks:** Python, R, C, C++, PyTorch, Scikit-learn, Poetry, ArcPy, Rasterio, GDAL, Xarray, Geopandas, Folium, geemap, GEE, PostgreSQL, Seaborn, Plotly, uv, Cartopy, Leaflet

**Tools/Platforms:** Git/GitHub, VS Code, AWS S3, HPC, Docker, Data quality control tools (OSMcha, OSMose, etc.)

**Software:** HEC-RAS(1D/2D), ArcGIS Suite (Desktop/Pro/Online/Experience Builder/Arcade/Story), QGIS, Survey123, SNAP, Global Mapper, SPSS, Pix4DMapper, Autodesk