

AYUSH KARKI

Civil Engineering | Water Resources (Hydrology, Hydraulics & Fluid Dynamics), Remote Sensing & Applied Machine Learning
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ACADEMIC PROFILE

- Civil Engineering graduate from Pulchowk Campus, IOE, Tribhuvan University, Nepal (74.46%, First Division).
- Academic interests span water resources engineering - hydrology, hydraulics and fluid dynamics - together with remote sensing and applied machine learning, with a focus on models that are both accurate and honest about their uncertainty, including in data-sparse settings.

RESEARCH INTERESTS

- Water resources and flood modelling; hydrology, hydraulics and fluid dynamics; remote sensing and GIS; applied machine learning and deep learning for civil and environmental engineering; uncertainty quantification and reliability of data-driven models; terrain-informed modelling for data-limited regions.

EDUCATION

- B.E. in Civil Engineering, Pulchowk Campus, Institute of Engineering, Tribhuvan University, Nepal (2019-2024), 74.46%, First Division.
- Higher Secondary (10+2, Science), Himalayan WhiteHouse International College, Kathmandu, Nepal (2017-2019). CGPA 3.61/4.0.
- School (SEE), Lahan Merry Children School, Lahan, Siraha, Nepal (2007-2017). SEE GPA 3.55/4.0.
- Relevant coursework: Hydrology, Water Resources Engineering, Hydraulics, Fluid Mechanics, GIS/Remote Sensing, Numerical Methods, Probability and Statistics, Surveying and Engineering Design.

RESEARCH EXPERIENCE

- First-author manuscript under peer review (Georisk, Taylor & Francis); preprint: <https://doi.org/10.31223/X5C21W>. "Multi-Scale Pixel and Slope-Unit Landslide Susceptibility Mapping with Applicability-Domain Validation," Karnali Highway corridor (~2,155 km²), western Nepal. Python and geospatial modelling I developed for this study:
 - Engineered nine topography, hydrology, land-cover and road-proximity conditioning factors and built raster workflows (NDVI/NDWI, resampling, masking, raster-stack preparation, prediction-map export) with rasterio, GeoPandas and NumPy.
 - Compared pixel and slope-unit mapping units across multiple moving-window scales (3×3, 15×15, 25×25 on a 12.5 m DEM).
 - Trained and tuned Random Forest, RBF-SVM and XGBoost with Bayesian search, Platt-scaled probability calibration and an equal-weight mean-probability ensemble (scikit-learn).
 - Validated with spatially blocked cross-validation (1,000 m blocks) to remove spatial-autocorrelation optimism; reported ROC/AUC, confusion matrices and SHAP feature-importance analysis.
 - Built a Mahalanobis-distance applicability-domain mask flagging where predictions extrapolate beyond the training feature space, published as a trusted/untrusted reliability layer.
 - Prototyped CNN/deep-learning workflows with Optuna-based tuning for patch-based hazard modelling (PyTorch).
- Group final-year project: Pre-Feasibility Study of the Manohara Irrigation Project — we analysed DHM hydro-meteorological data, monthly flows, irrigation water demand and the 100-year flood discharge, with HEC-RAS/QGIS workflows and hydraulic design of the intake, canal, settling basin and distribution structures.

TECHNICAL SKILLS

- Scientific programming and ML: Python (NumPy, pandas, Matplotlib, GeoPandas, rasterio, scikit-learn, PyTorch), C programming, LaTeX.
- Web and documentation: HTML, CSS, JavaScript.
- GIS, water and civil software: QGIS, ArcGIS, PostGIS, SNAP, HEC-RAS, EPANET, Hydrognomon, CROPWAT, AutoCAD, Civil 3D, ETABS, SAFE, MS Office, MS Project.