Naman Kishan Rastogi

Curriculum Vitae

Ph.D. Candidate, Civil, Environmental and Architectural Engineering, University of Colorado Boulder

+1-303-974-8546 | Naman.Rastogi@colorado.edu | namanrastogiiisc@gmail.com

CIRES profile | github.com/NamanIISc1998 | LinkedIn

Research Profile

I build probabilistic flood early warning systems for large, data scarce, monsoon fed river basins, developed on the transboundary Brahmaputra (India and Bangladesh) and designed to transfer to other vulnerable basins in low and middle income countries. My work links corrected rainfall forecasts, hydrologic and Bayesian river stage models, SWOT satellite water levels, and ensemble hydraulic modeling into probabilistic flood maps. As a postdoc, I aim to connect these forecasts to expected damage, anticipatory cash, and parametric insurance so that warnings and support reach people before the flood.

Research interests: flood early warning and flood risk in low and middle income countries; satellite hydrology for ungauged and transboundary rivers; forecast based financing and parametric insurance; climate drivers of South Asian monsoon floods and droughts.

Education

University of Colorado Boulder **2023 to Spring 2027 (expected)**

Ph.D. in Civil Engineering, CGPA 4.00/4.00 *Boulder, Colorado, USA*

Advisor: Prof. Balaji Rajagopalan. Dissertation focus: Bayesian Hierarchical and Causal Network Based Models for Riverine Flood Risk Warning and Assessment

Indian Institute of Science (IISc) **2021 to 2023**

M.Tech in Water Resources Engineering, CGPA 9.0/10.0 *Bangalore, India*

Advisor: Prof. Pradeep P. Mujumdar (Retired). Ranked 2nd in cohort. Supported by the Ministry of Education, Government of India.

G. B. Pant Institute of Engineering and Technology **2016 to 2020**

B.Tech in Civil Engineering, 91 percent, Institute Topper *Pauri, Uttarakhand, India*

Publications

1. **Rastogi, N. K.**, Nanditha, J. S., & Rajagopalan, B. (2026). Understanding streamflow variability in the Brahmaputra River Basin through Bayesian causal networks. *Earth's Future*. doi:10.1029/2026EF008056.

2. **Rastogi, N. K.**, Rajagopalan, B., & Ossandón, Á. (2025). Bayesian hierarchical network model for forecasting daily river stage for rainfed river networks. *Journal of Hydrology*, 654, 132894. doi:10.1016/j.jhydrol.2025.132894.

3. **Rastogi, N. K.**, Rajagopalan, B., Hopson, T., & Minear, T. J. (2026). Integrated riverine flood warning system coupling river stage predictions with ensemble hydraulic modeling. *Water Resources Research*. In revision.

4. **Rastogi, N. K.**, Kleiber, W., & Rajagopalan, B. (2026). A space-time statistical model for post-processing of daily precipitation forecasts. *Water Resources Research*. In revision.

5. **Rastogi, N. K.**, Minear, T. J., Rajagopalan, B., & Williams, B. (2026). Reconstructing continuous river water surface elevation from sparse SWOT satellite observations using a Bayesian hierarchical framework. *Water*

Resources Research. Under review.

6. **Rastogi, N. K.**, Deka, P., Minear, T. J., Rajagopalan, B., & Saharia, M. Gauge informed Bayesian hierarchical reconstruction of SWOT water surface elevations across the Brahmaputra River Basin. *Nature Scientific Data*. Data Descriptor, in preparation.

7. Turner, M., **Rastogi, N. K.**, Rajagopalan, B., & Hoerling, M. Causal drivers and teleconnections of the long term Colorado River Basin drought. *Climate Dynamics*. In preparation.

Research Experience

Probabilistic Flood Early Warning System, Brahmaputra River Basin (India and Bangladesh) 2023 to Present

Ph.D. Research, CU Boulder. Collaborators: B. Rajagopalan, T. Hopson (NCAR), T. Minear (CIRES), W. Kleiber. Funding: Ministry of Earth Sciences, India; CIRES

- Developed a space time Hierarchical Bayesian Precipitation Post Processor (HBPP) that corrects spatial and temporal biases in ensemble rainfall forecasts over the Brahmaputra (about 580,000 km^2) and Narmada (about 98,800 km^2) basins; corrected rainfall drives VIC and SAC-SMA hydrologic models (*Water Resources Research*, in revision).
- Developed a Bayesian hierarchical network model (BHNM) in R and Stan for probabilistic river stage forecasts one to five days ahead across a rain fed gauge network, using the hydrologic flow forecasts as input (*Journal of Hydrology*, 2025).
- Propagated a 100 member forecast ensemble through HEC-RAS 2D to produce probabilistic flood inundation and exceedance maps for the Guwahati region, validated against gauge and SWOT driven runs, as the basis for impact based warnings (*Water Resources Research*, in revision).
- Assembled a gap free record of 12 stage gauges across India and Bangladesh (2010 to 2026) with gauge data partners in both countries.

BRACE: Continuous River Water Levels from Sparse SWOT Satellite Data 2024 to Present

Ph.D. Research, CU Boulder. Collaborators: T. Minear (CIRES), B. Rajagopalan, B. Williams (NASA JPL). Funding: NASA, Award 80NSSC24K1665

- Developed a Bayesian hierarchical model in Stan that turns sparse SWOT overpasses into continuous water surface elevation at 569 river nodes, validated against USGS gauges and 27 independent in river pressure transducers (median NSE 0.97).
- Applied BRACE to the Brahmaputra, producing continuous daily water levels at more than 3,400 river nodes from 2010 to 2026; the dataset will be released publicly for researchers and agencies (*Nature Scientific Data*, in preparation).
- Extended BRACE to jointly model Sentinel-2 and SWOT river width at matched nodes against posterior water surface elevation.
- Scaling the workflow on HPC to more than 250 USGS gauges across the United States, benchmarking against SWOT and OPERA DSWx-HLS products and separating rain affected from non rain behavior.

Channel Geometry, Resistance, and Rating Curves from Satellite Data 2026 to Present

Ph.D. Research, CU Boulder. BRACE extension

- Inverting channel geometry and Manning's resistance from BRACE water levels, satellite width, and gauged discharge, and deriving reach scale rating curves for the Brahmaputra with the Inunda hydrodynamic model

and SWOT and SWORD data.

Climate Drivers of Floods, Droughts, and Water Availability 2024 to Present

Ph.D. Research, CU Boulder. Collaborators: B. Rajagopalan, M. Hoerling (NOAA), M. Turner. Funding: Ministry of Earth Sciences, India

- Built Bayesian causal networks that map teleconnection hotspots driving interannual flood variability in the Brahmaputra, identifying ENSO, IOD, and MJO pathways, to support seasonal flood outlooks (*Earth's Future*, 2026).
- Extending the framework with exploratory graph analysis to All India Summer Monsoon rainfall, and applying it to the 25 year Colorado River Basin drought.

Nonstationary IDF Curves under Climate Change for Urban Flood Risk 2021 to 2023

M.Tech Thesis, IISc Bangalore. Funding: Ministry of Education, India

- Modeled nonstationary GEV based intensity duration frequency curves with climate covariates for Bangalore under CMIP6 scenarios, using LSTM disaggregation, PCA, and fuzzy clustering, to inform urban stormwater design.

Water Resource Vulnerability Index for Hilly Districts of Uttarakhand 2019 to 2020

B.Tech Project, G. B. Pant Institute of Engineering and Technology

- Built a composite vulnerability index from hydrological, environmental, and socioeconomic indicators and mapped district level water stress in ArcGIS to support policy recommendations.

Ongoing Work

- **Public flood warning website and app:** turning the real time Brahmaputra forecasting and inundation system into a public platform where communities can view forecasts and upload geotagged photos of flooding and river gauges that feed back into the forecasts.
- **ENSO pattern versus magnitude:** testing whether the spatial pattern of Pacific warming matters more than El Niño magnitude for the Indian Summer Monsoon, using the 2026 El Niño and past strong events.
- **Himalayan precipitation extremes:** trends in extreme rainfall across the Nepal Himalayan belt using quantile regression, and the possible role of aerosols.

Grants, Fellowships, and Awards

- **CIRES Graduate Research Assistantship (GSRA)**, CIRES, University of Colorado Boulder, full year appointment, $75,000, 2026 to 2027
- **CECA Travel Fund Award**, CIRES, University of Colorado Boulder, 2026
- **Graduate School Travel Grant**, University of Colorado Boulder, for AGU 2024, AGU 2025, and AGU 2026
- **Awtar and Teji Singh Fellowship**, College of Engineering and Applied Science, University of Colorado Boulder, 2023 to 2024
- **M.Tech Scholarship**, Ministry of Education, Government of India, 2021 to 2023
- **Ranked 2nd**, M.Tech Cohort, Indian Institute of Science, Bangalore, 2023
- **All India Rank 399**, GATE Civil Engineering, among approximately 115,000 candidates (99.65 percentile), 2021

- **Institute Topper**, B.Tech Civil Engineering, G. B. Pant Institute of Engineering and Technology, 2020

Invited Talks and Seminars

- **November 4, 2026.** A Bayesian Reconstruction for Continuous River Water Surface Elevation from Sparse SWOT Satellite Data. Boase Seminar Series, **University of Colorado Boulder**, USA.
- **September 29, 2026.** Bayesian Hierarchical Modeling and SWOT Satellite Altimetry Toward an Operational Probabilistic Flood Early Warning System. **Purdue University**, USA.
- **November 26, 2025.** Advances in Bayesian Hierarchical and Causal Network Models for Riverine Flood Forecasting and Hydroclimate Diagnostics. **Imperial College London**, UK.
- **November 20, 2025.** From Climate Drivers to Flood Inundation: A Bayesian Framework for Understanding and Predicting Monsoon River Hazards. EGNR 601, **Ball State University**, USA.
- **November 4, 2025.** Bayesian Hierarchical and Causal Network Based Models for Riverine Flood Risk Warning and Assessment. **Indian Institute of Remote Sensing (IIRS), ISRO**, India.
- **November 3, 2025.** Integrated Riverine Flood Warning System Coupling River Stage Predictions with Hydraulic Modeling. Kotak School of Sustainability, **IIT Kanpur**, India.
- **September 24, 2025.** An Integrated Framework for Riverine Early Flood Risk Warning and Assessment. Boase Seminar Series, **University of Colorado Boulder**, USA.
- **December 4, 2024.** Bayesian Hierarchical Network Model for Forecasting Daily River Stage in a River Network. Boase Seminar Series, **University of Colorado Boulder**, USA.
- **October 24, 2024.** Bayesian Hierarchical Network Model for Forecasting Daily River Stage in River Networks. **IIT Roorkee**, India.

Conference Presentations

- **Rastogi, N. K.**. Causal Drivers of All India Summer Monsoon Precipitation Using Graph Based Bayesian Networks. *AMS Annual Meeting*, 2027. Upcoming.
- **Rastogi, N. K.**, Minear, T. J., & Rajagopalan, B. (2026). A Bayesian Reconstruction for Continuous River Water Surface Elevation (BRACE) from Sparse SWOT Satellite Data. *AGU Fall Meeting*. Poster, upcoming.
- **Rastogi, N. K.**, Rajagopalan, B., & Kleiber, W. (2026). A Space Time Statistical Model for Post Processing of Daily Precipitation Forecasts. *AGU Fall Meeting*. Oral, upcoming.
- **Rastogi, N. K.**, Minear, T. J., & Rajagopalan, B. (2026). Reconstructing Continuous River Water Surface Elevation from Sparse SWOT Satellite Observations. *CIRES Rendezvous*, May 2026. Poster.
- **Rastogi, N. K.**, Rajagopalan, B., & Kleiber, W. (2026). A Space Time Statistical Model for Post Processing of Daily Precipitation Forecasts. 20th *HydroScience Symposium*, CU Boulder, April 2026. Oral.
- **Rastogi, N. K.**. Can Sparse Satellite Overpasses Be Turned Into a Continuous River Record? *NSF NCAR UCAR CIRES Student Summer Conference*, July 2026. Poster and lightning talk.
- **Rastogi, N. K.**, Nanditha, J. S., & Rajagopalan, B. (2025). Understanding interannual variability of river basin flows through Bayesian causal networks. *AGU Fall Meeting*, New Orleans, December 2025. Poster.
- **Rastogi, N. K.**, Rajagopalan, B., Hopson, T., & Minear, T. J. (2025). Integrated riverine flood warning system coupling river stage predictions with hydraulic modeling. *AGU Fall Meeting*, New Orleans, December 2025. Poster.

- **Rastogi, N. K.**, Rajagopalan, B., & Nanditha, J. S. (2025). Understanding streamflow variability in the Brahmaputra River Basin: A Bayesian network approach. *CIRES Rendezvous*, May 2025. Poster.
- **Rastogi, N. K.**, Rajagopalan, B., & Hopson, T. (2025). A Bayesian hydraulic hybrid framework for monsoon flood warning in the Brahmaputra Basin. *HydroScience Symposium*, CU Boulder, April 2025. Oral.
- **Rastogi, N. K.**, Rajagopalan, B., & Ossandón, Á. (2024). Bayesian hierarchical network model for forecasting daily river stage in a river network. *AGU Fall Meeting*, Washington, DC, December 2024. Poster.
- **Rastogi, N. K.**, & Rajagopalan, B. (2024). Bayesian hierarchical network model for forecasting daily river stage in a river network. *CIRES Rendezvous*, May 2024, Poster; *HydroScience Symposium*, April 2024, Oral.
- **Rastogi, N. K.**, Wadhwa, A., & Mujumdar, P. P. (2023). Impact of climate change on non stationary IDF curves for urban areas. *EGU General Assembly*, Vienna, April 2023. Poster. doi:10.5194/egusphere-egu23-2673.

Teaching and Mentoring

- **Teaching Assistant**, CVEN 5454 Probability and Statistical Methods for Natural and Engineered Systems (graduate course), CU Boulder, Fall 2024, 2025, and 2026, with Prof. Balaji Rajagopalan. Held office hours and guided students through R and Python based statistical modeling.
- **Mentor**, Student Activity Cell, G. B. Pant Institute of Engineering and Technology, 2019 to 2020.

Leadership and Service

- **Primary Convener and Chair**, AGU Fall Meeting 2026, Session H096, "Land-Ocean-Atmosphere Drivers of Hydroclimatic Extremes: Prediction and Early Warning in the South Asian Monsoon," with co-conveners B. Rajagopalan, M. Saharia, and P. Deka. Invited speaker: Dr. Madhavan Nair Rajeevan.
- **President**, American Water Resources Association (AWRA), CU Boulder Student Chapter, 2026 to 2027 (Secretary, 2025 to 2026).
- **President**, Water Buffs Student Organization, CU Boulder, 2026 to 2027 (Secretary, 2025 to 2026).
- **Stakeholder engagement:** flood forecasting research with agencies and gauge data partners in India and Bangladesh; SWOT research with CIRES and NASA collaborators.
- **Science writing:** Editor in Chief, *ECHO* (university newspaper); published writer in *Times of India* and regional dailies, 2016 to 2020. President, Literary Bureau, 2019 to 2020.
- **Memberships:** American Geophysical Union (2024 to present); American Meteorological Society (2026 to present); CIRES CECA (2023 to 2027).

Academic Visits, Training, and Certifications

- **RiverWare Certified Course**, CADSWES, University of Colorado Boulder: river and reservoir system operations and water resources planning.
- **UK academic visits:** UK Centre for Ecology and Hydrology (flood hydrology and basin modeling); Imperial College London (WSI-MOD integrated water resources simulation); University of Exeter (flood damage assessment frameworks).
- **Field and industrial training, India:** Irrigation Division, Rishikesh, canal construction and supervision (2018); Drainage Division, Public Works Department, Dehradun, city drainage infrastructure (2017 to 2018); ONGC, Dehradun, building retrofitting (2019).

Skills

- **Modeling:** HEC-RAS 2D, VIC, SAC-SMA, RiverWare, MODFLOW, SWMM; flood inundation mapping, rating curves, channel geometry inversion.
- **Statistics and machine learning:** Bayesian hierarchical and nonstationary models, Bayesian causal networks, ensemble post-processing, uncertainty quantification, LSTM, PCA, clustering.
- **Satellite data:** SWOT, SWORD, Sentinel-2, OPERA DSWx-HLS, CMIP6.
- **Computing:** Python, R, Stan, MATLAB; SLURM on the CU Alpine HPC cluster; ArcGIS, QGIS.
- **Languages:** English, Hindi, Punjabi.

References

- **Prof. Balaji Rajagopalan**, Department of Civil, Environmental and Architectural Engineering, University of Colorado Boulder. Ph.D. Advisor. balajir@colorado.edu
- **Dr. Toby J. Minear**, CIRES, University of Colorado Boulder. SWOT and BRACE Collaborator. tminear@colorado.edu
- **Dr. Thomas Hopson**, Research Applications Laboratory, National Center for Atmospheric Research (NCAR). Flood Forecasting Collaborator. hopson@ucar.edu
- **Prof. Ben Livneh**, Department of Civil, Environmental and Architectural Engineering, University of Colorado Boulder. ben.livneh@colorado.edu