Shahryar Khalique Ahmad

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Education

University of Washington, Seattle 2018–2021
Doctor of Philosophy in Civil and Environmental Engineering
Dissertation: *Towards Forecast-Informed Sustainable Hydropower Operations*
Advisor: Dr. Faisal Hossain

University of Washington, Seattle 2016–2017
Master of Science in Civil and Environmental Engineering
Thesis: *Investigating the value of Weather Forecasts from Numerical Prediction Models for Hydropower Maximization*
Advisor: Dr. Faisal Hossain

Indian Institute of Technology, Kanpur 2012–2016
Bachelor of Technology in Civil Engineering

Research Experience

Research Scientist, NASA Goddard Space Flight Center 2021-present
Hydrological Sciences Laboratory

- Prototyping Freshwater Pilot of Earth Information System demonstrating open science and visualization capabilities to further the outreach of NASA datasets for freshwater
- Investigating the evolution and mechanism of hydrologic extremes, such as floods and droughts using hydrological modeling and data assimilation

Graduate Research Assistant 2016-2021
SASWE Research Group, University of Washington

- Management of fully automated operational web interface of South Asian Surface Water Modeling System (SASWMS) used by various operational agencies in South Asia
- Development of cropwater demand model for an irrigation advisory for marginal scale-farmers in Southeast Asia using weather forecasts and remote sensing products such as GRACE
- Prototyping Flood Inundation Forecast and Management system for Houston
- Deployment and management of Variable Infiltration Capacity (VIC) hydrologic model for Mekong River Basin
- Assessment of future volume change in Tonle Sap Lake in Mekong River Basin using climate model projections and satellite data (INFEWS project)

Student Intern, NASA Goddard Space Flight Center Summer 2020
Supervisor: Dr. Sujay V. Kumar

- Developed a robust machine learning algorithm to classify flooded and permanent waters from realtime microwave remote sensing products
- Integrated Google's cloud computing-based AI platform with Google Earth Engine's server side processing to achieve fast and computationally efficient method of flood mapping

Student Intern, NASA Goddard Space Flight Center Summer 2017
Supervisor: Dr. Sujay V. Kumar

- Developed interactive state-of-the-art web based framework, **LIS Atlas**, to visualize Land Information System (LIS)-generated model output from multiple model domains and configurations at different timescales

– Programmed initial prototype for the FEWS NET project over Central Asia and Africa to monitor snow conditions and water availability, respectively

– Implemented capabilities to generate outputs from Land surface Verification Toolkit (LVT) at various spatial and temporal scales, including quantitative evaluations of model outputs compared to observations.

MITACS Globalink Research Intern Summer 2015

Supervisor: Prof. Anders Knudby, Simon Fraser University, Burnaby, Canada

– Applied radiative transfer model for satellite-derived bathymetry with case study of Canadian waters

– Simulated above-water reflectance to retrieve per-pixel water depth using efficient model inversion algorithms

Awards and Fellowships

- ASCE EWRI Best Case Study Award in Journal of Hydrologic Engineering 2021
- NASA Space Apps Challenge *Best Use of Data* Award 2020
- MIT Energy Hack *Chevron Challenge Winner* 2020
- Grow with Google Challenge Scholarship 2018
- Washington State AWRA Student Fellowship ($ 2000) 2017
- Ivanhoe Foundation Fellowship ($ 5000) 2017
- Mitacs Globalink Graduate Fellowship for Research Internship 2015
- Academic Excellence Award at IIT Kanpur, India 2016
- Academic Excellence Award at IIT Kanpur, India 2015
- Merit-cum-Means Scholarship at IIT Kanpur, India 2013–2014

Publications

Refereed

1. **Ahmad, S.K.**, Hossain, F., Holt, G., Galleli, S., Pavelsky, T. (2021). Predicting the likely thermal impact of current and future dams around the world, *Earth's Future* (in press)

2. Konapala, G., Kumar, S.V., **Ahmad, S.K.** (2021). Exploring Sentinel-1 and Sentinel-2 diversity for flood inundation mapping using deep learning, *ISPRS Journal of Photogrammetry and Remote Sensing* 180:163-173. DOI: 10.1016/j.isprsjprs.2021.08.016

3. Bose, I., Jayasinghe, S., Meechaiya, C., **Ahmad, S.K.**, Biswas, N. and Hossain, F., (2021). Developing a Baseline Characterization of River Bathymetry and Time-Varying Height for Chindwin River in Myanmar Using SRTM and Landsat Data. *Journal of Hydrologic Engineering*, 26(11), p.05021030. DOI: 10.1061/(ASCE)HE.1943-5584.0002126

4. Bose, I, Hossain, F., Eldardiry, H., **Ahmad, S.K.**, Biswas, N.K., Lee, H., Aziz, M., and Kamal, M.S. (2020). Integrating Gravimetry Data with Thermal Infra-red Data from Satellites to Improve Efficiency of Operational Irrigation Advisory in South Asia, *Water Resources Research* DOI:10.1029/2020WR028654

5. Jameel, Y., Stahl, M., **Ahmad, S.K.**, Kumar, A., Perrier, G. (2020). India needs an effective flood policy. *Science* 369(6511), pp. 1575.

6. **Ahmad, S.K.**, F. Hossain, T. Pavelsky, G. Parkins, S. Yelton, M. Rodgers, S. Basile, S. Ghafoor, D. Haldar, R. Khan, N. Shawn, A. Haque and R. Biswas (2020). Estimating Volumetric Water Storage in Seasonal and Transboundary Runoff-Dominated Wetlands Using Citizen Science and Satellite Remote Sensing Data, *Water Resources Research*, p.e2020WR027989. DOI:10.1029/2020WR027989

7. Beveridge, C., Hossain, F., Biswas, R.K., Haque, A.A., **Ahmad, S.K.**, Biswas, N.K., Hossain, M.A. and Bhuyan, M.A., 2020. Stakeholder-driven development of a cloud-based, satellite remote sensing tool to monitor suspended sediment concentrations in major Bangladesh rivers. *Environmental Modelling and Software*, p.104843. DOI: 10.1016/j.envsoft.2020.104843

8. **Ahmad, S.K.**, and Hossain, F., 2020. Realizing ecosystem-safe hydropower from dams. *Renewables: Wind, Water, and Solar*, 7(1), pp.1-23. DOI: 10.1186/ s40807-020-00060-9

9. **Ahmad, S.K.**, Hossain, F. (2020). Forecast-Informed Hydropower Optimization at Long and Short-time scales for a Multiple Dam Network. *Journal of Renewable and Sustainable Energy* 12. DOI: 10.1063/1.5124097

10. **Ahmad, S. K.**, Hossain, F. (2020). Maximizing Energy Production from Hydropower Dams using Short-Term Weather Forecasts. *Renewable Energy* 146, pp.1560-1577. DOI: 10.1016/j.renene.2019.07.126

11. Daly, K., Hossain, F., **Ahmad, S.K.**, Bonnema, M., Beveridge, C. Nijssen, B., Holtgrieve, G. (2020). Recent Warming of the Tonle Sap Lake, Cambodia: Implications for one of the World's Most Productive Inland Fisheries. *Lakes and Reservoirs*.

12. Hossain, F., Harsha, K.S., Goyal, S., **Ahmad, S.K.**, Lohani, B., Balaji, N., Tripathi, S. (2020). Towards Affordable and Sustainable Water-Smart Irrigation Services. AWRA Impact Jan 2020 issue

13. **Ahmad, S. K.**, Hossain, F. (2019). A generic data-driven technique for forecasting of reservoir inflow: Application for hydropower maximization *Environ. Model. Softw* 119, pp.145-167. DOI: 10.1016/j.envsoft.2019.06.008

14. **Ahmad, S. K.**, Hossain, F. (2019). A Web-Based Decision Support System for Smart Dam Operations Using Weather Forecasts. *Journal of Hydroinformatics* 21(5), pp.687-707. DOI: 10.2166/hydro.2019.116

15. **Ahmad, S. K.**, Hossain, F., Eldardiry, H., Pavelsky, T. (2019). A Fusion Approach for Water Area Classification using Visible, Near Infrared and Synthetic Aperture Radar for South Asian Conditions, *IEEE Transactions on Geoscience and Remote Sensing*, pp.1-10. DOI: 10.1109/tgrs.2019.2950705

16. [1] Sikder, S., **Ahmad, S. K.**, Hossain, F., Gebregiorgis, A., Lee, H. (2019). Case Study: A Rapid Urban Inundation Forecasting Technique Based on Quantitative Precipitation Forecast for Houston and Harris County Flood Control District. *Journal of Hydrologic Engineering*, 24(8), p.05019017.

17. Eythorsson, D., Gardarsson, S.M., **Ahmad, S. K.**, Hossain, F., Nijssen, B. (2019). Arctic Climate and Snow Cover Trends – Comparing Global Circulation Models with Remote Sensing Observations. *International Journal of Applied Earth Observation and Geoinformation*, 80, pp.71-81.

18. Hossain, F., Bonnema, M., Biswas, N., **Ahmad, S. K.**, Duong, B., Luong, N. (2019). When Floods Cross Borders, Satellite Data Can Help. EOS (AGU) Feb 16, 2019.

19. **Ahmad, S. K.**, Hossain, F. (2018). Generating More Hydropower Using Weather Forecasts. AWRA Impact May 2018 issue.

20. Knudby A., **Ahmad S. K.**, Ilori C. (2016). The potential for Landsat-based bathymetry in Canada. *Canadian Journal of Remote Sensing, 42(4), pp.367-378.*

Non-refereed

1. **Ahmad, S. K.**, Hossain, F. (2021). The hot and cold of current and future hydropower dams. Water and Power Magazine, May 2021 issue, pp. 35-36.

[1] Won Best Case Study Award

2. **Ahmad, S.K.**, Bonnema, M., Hossain, F. (2020). Can you generate more hydro with less dams? International Water Power and Dam Construction Magazine, January 2020 issue, pp. 38-40.

Conferences and Oral Presentations

1. **Ahmad S. K.**, F. Hossain. (Jun 2021). Ushering in a New Frontier to Meet Grand Energy Challenges: Time to Revisit Hydropower Operations for Resilient System. *World Sustainable Energy Days. 2021.*
2. **Ahmad S. K.**, F. Hossain. (Dec 2020). Predicting Thermal Impact of Future Hydropower Dams for Ecosystem-Safe Operations. *In AGU Fall Meeting Abstracts. Dec 2020.*
3. **Ahmad S. K.**, F. Hossain. (Dec 2019). Maximizing hydropower production with smart multi-dam operations using long and short-term forecasts. *In AGU Fall Meeting Abstracts. Dec 2019.*
4. Eythorsson, D., Gardarsson, S.M., **Ahmad, S.K.**, Hossain, F., Nijssen, B. (Dec 2019). Arctic Climate and Snow Cover Trends – Comparing Global Circulation Models with Remote Sensing Observations. *In AGU Fall Meeting Abstracts. Dec 2019.*
5. **Ahmad S. K.**, F. Hossain. (Dec 2018). Computationally Efficient Daily Streamflow Forecasting for Hydropower Maximization Using Artificial Neural Networks. *In AGU Fall Meeting Abstracts. Dec 2018.*
6. Knudby A., Roy D., **Ahmad S.K.**, Bird S., Ilori C., 2016. Satellite-derived bathymetry for Canada, *Canadian Hydrographic Conference, May 16-19, 2016, Halifax, Nova Scotia, Canada.*
7. **Ahmad S. K.**, Srinivasan V., Ghosh P., 2014a. Analysis of annular footings and anchors lying on elastic soil medium using finite difference technique.*5th International Congress on Computational Mechanics and Simulation (ICCMS) 2014, India.*
8. **Ahmad S. K.**, Srinivasan V., Ghosh P., 2014b. Analysis of axisymmetric foundations subjected to axial compressive or tensile static loads on Gibson soil model. *Indian Geotechnical Conference (IGC) 2014, India.*

Teaching

- **Teaching Assistant** at University of Washington — Fall 2020
  Satellite Remote Sensing For Water Resources (CEWA 566)
- **Teaching Assistant** at University of Washington — Fall 2019
  Satellite Remote Sensing For Water Resources (CEWA 566)
- **Guest Lecture** at University of Washington — Winter 2018
  Quantitative Water Resources Management (CEE 599)

Invited Talks

- **World Sustainable Energy Days (WSED)**, Virtual — Jun 2021
  Ushering in a New Frontier to Meet Grand Energy Challenges: Time to Revisit Hydropower Operations for Resilient System
- **Second AI and Data Science Workshop by JPL**, Virtual — Feb 2021
  Energy from AI: Ushering in a New Frontier in Smart Hydropower Generation through Artificial Intelligence
- **MIT Energy Nights**, Virtual — Oct 2020
  Ecosystem-Safe Hydropower from Existing and Future Dams in a Challenging Climate
- **Sensing Rivers Workshop**, University of Washington — Sep 2020
  Remote Sensing of River Temperatures

Society Affiliations

- American Society of Civil Engineers (ASCE), *Student Member* 2017–current
- American Geophysical Union *Student Member* 2017–current
- American Water Resources Association *Student Member* 2016–current
- Freshwater Initiative, *Steering Committee Member* 2017–2018
- American Water Resources Association *Webmaster* 2016–2017

Community Service

Peer Reviews for International Scientific Journals

- Journal of Hydrologic Engineering (9)
- Environmental Modeling and Software (7)
- Water Resources Research (1)
- Journal of Hydrometeorology (1)
- Journal of Water Resources Planning and Management (1)
- IEEE *Access* (1)
- Stochastic Environmental Research and Risk Assessment (1)

Capacity Building and Outreach

- Trained Bangladesh Water Development Board (BWDB) on the cloud computing platform Google Earth Engine for applications in water resource management organized by SASWE Research Group, UW, 2021.
- Trained and helped participants during 2020 and 2021 SWOT Early Adopter Virtual Hackathon organized by NASA, CNES and UW.
- Interviewed by University of British Columbia, Vancouver BC, for sharing experiences and tips to students of atmospheric sciences course at UBC.
- Engaged in middle school science outreach for Discovery Days, an event organized by UW College of Engineering
- Trained participants during WaterHackWeek'19 on Google Earth Engine
- Organized events for UW Chapter of American Water Resources Association

Technical Training

- **JPL Summer School in Climate Sciences**, Virtual Aug 2020
  Participated in two-week virtual summer school organized by Jet Propulsion Laboratory (JPL) Center for Climate Sciences and Keck Institute for Space Studies on Satellite Observations and Climate Models.
- **Google Earth Engine Workshop for Advanced Users, Google**, Washington DC Dec 2018
  Two-day workshop on areal computations, optical/radar data fusion, and multi-temporal compositing and classification using Earth Engine API.

Skills

- **Programming:** Python, C/C++, MATLAB, Bash Scripting
- **Cloud Computing:** Google Earth Engine, AWS S3
- **Version Control:** Git
- **Machine Learning/Data Analytics:** TensorFlow, Keras, Pyrenn

- **Software/Modeling:** Variable Infiltration Capacity Model (VIC), Land Information System (LIS), SWAT, HEC-RAS, WRF, StormCAD, FlowMaster, CulvertMaster, ArcGIS Online, JupyterHub, GDAL
- **Web Development:** HTML, CSS, JavaScript, PHP, SQL, WordPress