STAHY 2023 – 13th International Workshop on Statistical Hydrology (STAHY)
8 – 10 November 2023, Northeastern University, Boston Massachusetts (USA)
Workshop Theme: Statistical Hydrology, Machine Learning, and Artificial Intelligence

WEDNESDAY, NOVEMBER 8 -- EARLY CAREER WORKSHOP *9AM - 2PM*
Location: Northeastern University Alumni Center Room 716 Columbus Ave, Boston, MA 02120

9:00-9:30 AM Welcome and introductions (Stacey Archfield)

9:30-10:30 AM "The Role of Big and Little Data in Hydrology and Artificial Intelligence"
Professor Auroop Ganguly, Northeastern University, who will describe the challenges associated with hydrologic data, their implications for domain-aware high performance computing, and how next-generation artificial intelligence may be able to provide solutions and where further developments may be necessary.

10:30-10:45 AM Break

10:45-11:45 AM "When Heavy Tails Disrupt Hydrologic Modeling"
Professor Richard Vogel, Tufts University, who will discuss the theoretical implications of developing datasets with high spatial and temporal resolution and offer practical solutions for dealing with these statistical issues.

11:45 AM-1:00 PM Lunch

1:00-2:00 PM "Perspectives on the Future of Hydrology and Artificial Intelligence"
Dr. Grey Nearing, Google, who will share perspectives on the future of hydrology, artificial intelligence, and machine learning and discuss potential career paths at the intersection of hydrology and artificial intelligence.

6:00 PM Early Career Dinner [Location TBD; Not included in registration fee]

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THURSDAY, NOVEMBER 9 -- STAHY WORKSHOP DAY 1

Location: Northeastern University Alumni Center Room 716 Columbus Ave, Boston, MA 02120

8:30 AM - 6 PM WORKSHOP / 7 - 9 PM ICEBREAKER RECEPTION

8:30 - 9:30 AM Welcome and opening remarks

- 8:30-8:45 Welcome and logistics
- 8:45-9:00 Overview of workshop
- 9:00-9:30 Opening remarks from **Dr. Usama Fayyad**, Executive Director for the Institute of Experiential Artificial Intelligence at Northeastern University

9:30 - 11:00 AM Invited presentations (Moderator: Richard Vogel)

- 9:30-9:45 **Professor Ana Barros**, University of Illinois at Urbana-Champaign
  A Deliberate Walk with Explainable AI in Hydrology
- 9:45-10:00 **Dr. Corrine Bowers**, Stanford University and U.S. Geological Survey
  Interpretable Machine Learning for Flood Damage Estimation: Challenges and Opportunities
- 10:00-10:15 **Dr. Grey Nearing**, Google
  Machine Learning for Flood Forecasting: Research to Operations
- 10:15-10:30 **Dr. Wouter Knoben**, University of Saskatchewan, STAHY 2022 Best Paper
  Inherent benchmark or not? Comparing Nash–Sutcliffe and Kling–Gupta efficiency scores
- 10:30-10:45 **Dr. Karen Ryberg**, U.S. Geological Survey
  Issues and Advancements in Flood-Frequency Analysis
- 10:45-11:00 **Professor Jennifer Dy**, Northeastern University
  [TBD]

11:00 - 11:30 AM Break

11:30 AM - 1:00 PM Hydrologic Prediction I (Moderator: Jared Smith)

- 11:30-11:45 E.S. Martins, **D.S. Reis Jr.** , J.M.R. Pereira, F. das Chagas Vasconcelos Jr.: *A Comprehensive Analysis of a Seasonal Forecast System for Hydrological Prediction for the State of Ceará, Brazil*
- 11:45-12:00 **R. Mantilla**, F. Gurbuz, A. Mudireddy, S. Xiao: *Using a Physics-based Hydrological Model and Storm Transposition to Investigate Machine-Learning Algorithms for Streamflow Prediction*
- 12:00-12:15 **R. Rocha**, A.S. Filho: *Streamflow forecast through dynamic hybrid Gaussian networks incorporating the influence of low-frequency SST phases*
- 12:15-12:30 **A. Roy**, K.S. Kasiviswanathan*: A physics-aware machine learning-based modeling framework for minimizing prediction uncertainty of hydrological models* (**SYSTA Awardee)
- 12:30-12:45 **F. Cappelli**, S. Grimaldi: *Feature importance measures for hydrological applications: insights from a virtual experiment*
- 12:45-1:00 **A. Dadkhah**, D.M. Rizzo, S. Hamshaw: *Spatiotemporal Analysis of Model Errors in Regional Hydrological Predictions of Drought: A Study in the Colorado River Basin*

1:00 - 2:30 PM Lunch

2:30 - 4:00 PM Hydrologic Prediction II (Moderator: Auroop Ganguly)

- 2:30-2:45 **S.K. Kuntla**, M.Saharia: *Prediction of a Hydrological Signature at Ungauged Stations Using Machine Learning* (**SYSTA Awardee)
- 2:45-3:00 **F. Houndekindo**, T.B.M.J. Ouarda: *Variable selection for regional estimation of wind speed at ungauged sites using machine learning: A comparative analysis*

3:00-3:15 **J.D. Smith**, S.B. Levin, C.C. Stillwell, A. Sekellick, K. Eng: *Classify-then-Predict Machine Learning to Estimate High Flow Generation Regions and Improve Flow Metric Predictions*

3:15-3:30 **A.N. Geetha Raveendran Nair**, A. Sankaran: *Advancing Hydrological Data Consistency: Evaluating the novel framework of Probabilistic Fusion Imputer using Neural Networks for Streamflow Data Imputation*

3:30-3:45 **J. Rodeschini**, A. Fusta Moro, A. Fassò, F. Finazzi: *Heteroskedastic spatiotemporal modelling: with application to livestock-driven air pollution*

3:45-4:00 **J. Walker**, J. Fair, P. Goodling, A. Gupta, B. Letcher: *Combining a Deep Learning AI/ML Model with Flow Distribution Statistics for Monitoring Headwater Streamflow using Timelapse Imagery*

4:00 - 6:00 PM Poster Presentations (Moderator: Stacey Archfield)

4:00-4:50 Introduction of posters (3 minutes per poster; 2 minutes for transition)

1. 4:00-4:05 **M. Valipour**: *Sustainable Systems Engineering by Artificial Intelligence for Predicting Drought in Colorado*
2. 4:05-4:10 **S. Fischer,** A. Schumann: *Discriminating Between Ordinary and Exceptional Flood Events and their Consideration in a Statistical Two-Component Model*
3. 4:10-4:15 **P. Das**, N.Barber , T.J. Vandal , A. Posch, K. Duffy, D. Singh, M. Hicks , K. van Werkhoven, A.R. Ganguly: *Hybrid Physics and Machine Learning for Precipitation Nowcasting*
4. 4:15-4:20 **B. FitzGerald**, D. Wright, A. Dietrich , S. Lawler: *Using Ratio Distributions to Delineate Statistically Homogeneous Domains for Stochastic Storm Transposition*
5. 4:20-4:25 **M. Nagaraj**, A. Rodriguez , T. Wahl: *Ensemble Machine Learning for Storm Surge Modelling along the Florida Coast*

6. 4:25-4:30 **V. Telesca**, G. Castronuovo, A. Ceppi: *Hydrological Factors and their Role in Covid-19 Transmission across different Italian Regions: an AI-Driven Analysis*
7. 4:30-4:35 **B. Shmagin**: *Hydrology as a Regional Science: Ontology and Semantic of Quantitative Cartography*
8. 4:35-4:40 **E. Dallan**, F. Marra, G. Fosser, M. Marani, M. Borga: *Assessing projected changes on sub-daily precipitation extremes: a non-asymptotic approach with a convection-permitting multi-model ensemble*
9. 4:40-4:45 **L. Lombardo**, L. Tarasova, R.M. Vogel, S. Papalexiou, R. Merz, P. Claps, A. Viglione: *Flood tailored regional rainfall-runoff modelling with stochastic discharge ensemble generation*
10. 4:45-4:50 **S.M. Papalexiou**: *Revisiting precipitation modelling with CoSMoS-2s*
11. **M. Kaur**, Y. Weinstein, A. Burg: *Ra isotopes in Jurassic aquifer and Hamat-Gader springs as a tool to constrain water sources and ages?* *(POSTER ONLY)*
12. **Y. Sabzevari** , S. Eslamian: *Temperature Increase Prediction using aSoft Computing Techniques for A Drought-Affected Region* *(POSTER ONLY)*
13. **D.M.L. Diongue**, G. Brunetti, C. Stumpp, F.C. Do, O. Roupsard, D. Orange, W. Faye, S. Sow, C. Jourdan, S. Faye: *A probabilistic framework for assessing the hydrological impact of Faidherbia albida in an arid area of Senegal* (**SYSTA Awardee) *(POSTER ONLY)*
14. **P. Kpiebaya**, E.E.Y. Amuah, S. Abdul-Ganiyu, B.N. Baatuuwie, V. K. Avornyo, B.W. Dekongmen: *Spatial assessment of groundwater potential using Quantum GIS and multi-criteria decision analysis (QGIS-AHP) in the Sawla-Tuna-Kalba district of Ghana* (**SYSTA Awardee) *(POSTER ONLY)*
15. **A. Sokolov**, P. Novikova: *On determining the estimated maximum of flood discharge* *(POSTER ONLY)*

4:50-6:00 Posters on display

6:00 - 7:00 PM Depart to Tufts University Joyce Cummings Center

Take Green Line inbound from Northeastern University to the Tufts/Medford stop
Follow signs for "Exit | Boston Ave, College Ave - Exit via Medford/Tufts"
Head southeast (left) on Boston Ave toward College Ave, approximately 100 feet
Turn left onto College Ave, go approximately 200 ft over bridge
Turn left to enter the Joyce Cummings Center just after crossing the bridge and walk approximately 100 feet to the entrance. Follow signs to icebreaker reception.

7:00 - 9:00 PM Icebreaker Reception, sponsored by Tufts University Data Intensive Studies Center at Tufts University (DISC) and the Department of Civil and Environmental Engineering *(Cash bar / Drinks not included)*

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FRIDAY, NOVEMBER 10 -- STAHY WORKSHOP DAY 2
Location: Northeastern University Cabral Center Room 40 Leon Street, Boston, MA 02120
9:00 AM - 5:30 PM WORKSHOP

9:00 - 9:15 AM Award Ceremony
IAHS Sivapalan Young Scientists Travel Awards (SYSTA) Winners
2022 STAHY Best Paper Award Winner

9:15 - 10:30 AM Drought, Subsurface hydrology, and Geomoprhology (Moderator: Stacey Archfield)
9:15-9:30 **G. Ravikumar**, B. Merz, A. Agarwal: *Driving mechanisms and prediction of compound dry and hot extremes during the Indian summer monsoon* (**SYSTA Awardee)
9:30-9:45 **J. Sung**, B. Kang: *Univariate and multivariate Copula drought frequency analysis for multi-purpose dam inflow*
9:45-10:00 **D. Kinder**, A. Avance, C.H. Smith, J.F. England: *Flood Hazard Estimation for Dam Safety Analysis – Current USACE Methods*
10:00-10:15 **O. Wani**, B. Noh, K. Dunne, M. Lamb: *Geomorphic risk maps for erosional hazard due to river migration - a probabilistic framework*
10:15-10:30 **O. Ledvinka**: *Looking for the gridded product capturing spatial distribution of soil moisture in the territory of Czechia*

10:30 - 11:00 AM Break

11:00 AM - 12:30 PM Hydrologic Change, Nonstationarity, and Extremes I (Moderator: Svenja Fischer)

- 11:00-11:15 **B. Kang**, T. Kim, J. Sung: *AI-based Surrogate modelling for predicting flood inflows to Namgang dam*
- 11:15-11:30 C. Sevigny, **S. Innocenti**, P. Matte, O. Champoux, M. Doghri, J. Morin: *Joint use of artificial intelligence and statistical models to simulate water level extreme events in the St-Lawrence fluvial estuary*
- 11:30-11:45 **J.R. Stedinger**, K. Eng: *Flood Quantile Estimators: GLS, at-site Top Kriging and TOP-GLS with Nested Catchments*
- 11:45-12:00 **G. Mascaro**, S. Papalexiou, D. Wright: *Stochastic Models Reveal New Insights into the Correlation Structure and Marginal Distribution of Short-Duration Precipitation*
- 12:00-12:15 **N. Devineni**, N. Najibi, U. Lall: *Compound Continental Risk of Multiple Extreme Floods in the United States*
- 12:15-12:30 C. Awasthi, S.A. Archfield, **S. Arumugam**: *Design-Flood Estimation Under Non-Stationarity Using Marginal Moments Approach*

12:30 - 2:00 PM Lunch

2:00 - 3:15 PM Hydrologic Change, Nonstationarity, and Extremes II (Moderator: Sankar Arumugam)

- 2:00-2:15 **S. Lawson**, K. Underwood, R. Diehl, D. Rizzo: *The Duration-Over-Threshold Model for Flood Frequency and Flow Regime Characterization*
- 2:15-2:30 **R. Mawalagedara**, A. Ray, J. Watson, K. Duffy, U. Bhatia, D. Aldrich, A.R. Ganguly: *Climate Resilience under Irreducible Uncertainty*
- 2:30-2:45 **Z. Brodeur**, S. Wi, G. Shabestanipour, J. Lamontagne, S. Steinschneider: *A hybrid, non-stationary Stochastic Watershed Model (SWM) for uncertain hydrologic projections under climate change*

2:45-3:00 **T. Over**, M. Marti, J. Ortiz: *The Joint Effect of Changes in Impervious Cover and Climate on Trends in Floods in Urbanizing Basins in the Midwestern United States*

3:00-3:15 **T. Kim**, B. Kang: *Framework of decision scaling for predicting dam inflows under climate stress scenarios*

3:15 - 3:45 PM Break

3:45 - 5:00 PM Hydrologic Change, Nonstationarity, and Extremes III (Moderator: Elena Volpi)

3:45-4:00 **C.H. Smith**, B. Skahill, J.F. England: *Nonstationary Flood Frequency Analysis with the Bayesian Estimation and Fitting Software, RMC-BestFit*

4:00-4:15 **D. Goutali**, F. Chebana: *Multivariate trend tests in hydrological frequency analysis*

4:15-4:30 **C. Awasthi**, S.A. Archfield, B.J. Reich, S. Arumugam: *Beyond Simple Trend Tests: Detecting Significant Changes in Design-Flood Quantiles*

4:30-4:45 **J. Doss-Gollin**, Y. Lu, B. Seiyon Lee: *A Bayesian Spatial Hierarchical Framework for Process-Informed Nonstationary Analysis of Multi-Duration Precipitation Frequencies*

4:45-5:00 **C.T. Vidrio-Sahagún**, J. He, A. Pietroniro: *Nonstationary extreme value analysis based on the Metastatistical distribution*

5:00 - 5:30 PM Closing

5:00-5:20 Reflections from the community (Led by Auroop Ganguly)

5:20-5:30 Acknowledgements (Stacey Archfield) / Announcement of STAHY 2024 Location (Elena Volpi)