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RESEARCH INTERESTS

- Hydrological and biogeochemical modelling of large-scale watersheds with different climatic and physiographic characteristics and incorporating human interactions with hydrosphere
- Using environmental models to study the cumulative impacts of anthropogenic and climate change on water/nutrients dynamics in watersheds
- Utilizing field and lab data to inform/constrain hydrochemical models outcomes

SUPERVISORY INTERESTS

- Teach undergraduate and graduate students how to implement relevant quantitative analyses, numerical modelling, and advanced data analysis approaches in their research
- Serving as a mentor for students towards career-based success
- Encourage students to think about open-ended questions in their research aiming to foster their creativity

SUMMARY OF QUALIFICATIONS

- Experienced in conducting research to solve water resources systems problems using hydrologic models
- Expert in hydrological/biogeochemical modelling and quantitative analysis of hydrological processes through in-depth exploration of field and remote sensing data and models' simulations
- Primary author of several peer-reviewed journal papers especially in recent years
- Proficient in teaching courses at various undergraduate levels to large classes of engineering students
- Two university teaching-related certificates from Centre for Teaching Excellence at University of Waterloo
- Received students-nominated best teaching assistant award
- Excellent verbal and written communication skills for teaching as well as presenting research findings
- Solid leadership and management skills to advance individual and team-based research projects

EDUCATION**PH.D. - CIVIL ENGINEERING**

Water Resources Engineering (Hydrology), University of Waterloo, Waterloo, Canada, 2014

THESIS: Developments in Informal Multi-criteria Calibration and Uncertainty Estimation in Hydrological Modelling

SUPERVISORS: Dr. Bryan A. Tolson, Dr. Loren S. Matott

MASTER OF SCIENCE – CIVIL ENGINEERING

Hydraulic Structures, Iran University of Science and Technology, Tehran, Iran, 2006

THESIS: Improved Honey-Bees Mating Optimization Algorithm in Operation of Reservoir Systems

SUPERVISOR: Prof. Abbas Afshar

BACHELOR OF SCIENCE - CIVIL ENGINEERING

Iran University of Science and Technology, Tehran, Iran, 2003

RESEARCH EXPERIENCE**POST-DOCTORAL RESEARCH FELLOW**

Dept. of Earth and Environ. Sci., University of Waterloo, Waterloo, Canada, Sep. 2014 – Present

- Implement a hydrological-biogeochemical model in a flexible framework for the Grand River Watershed (the largest inland river system in Southern Ontario) to provide management options for nitrogen delivery
- Develop a diagnostic model evaluation approach for identifying the most suitable hydrological and biogeochemical model structure in watersheds utilizing hydrochemical signatures
- Use satellite imagery to extract useful information for analyzing spatio-temporal variability of snow water equivalent and evaluating snowmelt modules in hydrologic models

RESEARCH ASSISTANT

Dept. of Civil and Environ. Eng., University of Waterloo, Waterloo, Canada, Sep. 2009 – Aug. 2014

- Applied lumped and semi-distributed conceptual rainfall-runoff models to multiple catchments and developed optimization-based methods for models' calibration and uncertainty analysis
- Evaluated different formal (statistical) and informal techniques in the calibration and uncertainty analysis of watershed models to quantify and improve models' predictive capacity
- Expanded an optimization-based framework to help hydrologists calibrate models through the quantification of hydrologically relevant objectives, and obtain reliable solutions to water resources management problems
- Implemented parallel-computing-enabled optimization strategies to facilitate calibration of computationally demanding hydrologic models

VISITING SCHOLAR

Dept. of Computational Hydrosystems, Helmholtz-Zentrum for Environmental Research, May – Jun. 2012

- Devised non-aggregation-based multi-objective approaches for calibration of mHM hydrologic model to improve model predictions in future
- Coded the PA-DDS calibration routine in FORTRAN to facilitate mHM model's calibration

RESEARCH ASSISTANT

Dept. of Hydrology and Hydraulic Eng., Vrije Universiteit Brussel, Brussels, Belgium, Sep. 2007 – Aug. 2009

- Designed and implemented optimization-based approaches for calibration of rainfall-runoff models employed in water resources systems analysis
- Prepared academic publications by conducting literature reviews, paper writing, and other research activities to present research findings in the field of hydrology

TEACHING EXPERIENCE**SESSIONAL LECTURER - 'PROBABILITY AND STATISTICS'**

Dept. of Civil and Environ. Eng., University of Waterloo, Waterloo, Canada, Fall 2013, Winter 2014, and Fall 2014

- Evaluated highly by students for approachability (**96%**), attitude towards teaching (**92%**) and professor-class relationship (**92%**)

TEACHING ASSISTANT

Dept. of Civil and Environ. Eng., University of Waterloo, Waterloo, Canada, Sep. 2009 – Dec. 2013

- Gained average **4.6 out of 5** in students TA evaluations

TEACHING TRAINING

- 'Certificate of University Teaching – CUT', Centre for Teaching Excellence, University of Waterloo, 2014
- 'Fundamentals in University Teaching', Centre for Teaching Excellence, University of Waterloo, 2011
- 'ExpectATions' – two-day educational program for TAs, Faculty of Engineering, University of Waterloo, 2010

SERVICE EXPERIENCE AND LEADERSHIP**EDITORIAL ACTIVITIES**

- Peer Reviewer for Scientific Journals: Water Resour. Res., Environ. Modelling & Software, Water Resour. Mngmnt., Adv. in Eng. Software, Hydrological Sciences Journal, Stoch. Environ. Res. and Risk Assess.

SUPERVISORY EXPERIENCE

- Supervised four undergraduate research assistants and coop students working on the project 'Canada's nitrogen legacy: Combining modelling and isotope approaches for drinking water quality and aquatic ecosystem health of rivers', Sep. 2014 – present

SCIENTIFIC AND PROFESSIONAL COMMITTEES INVOLVEMENT

- *Leader* of Students and Young Professional (SYP) chapter of Canadian Water Resources Association-Ontario branch (CWRA-O) in Waterloo May 2013 – present
- *Board member* of CWRA-O, May 2013 – May 2015
- *Academic committee member* of 'Students of the Water Institute Graduate Section (SWIGS)', University of Waterloo, Jan. 2012 – Aug. 2013
- *Water Councillor* in 'Civil and Environmental Engineering Graduate Association (CE²GA)', University of Waterloo, May 2012 – Aug. 2014
- *Graduate student member* at 'Faculty of Engineering Council Meetings', University of Waterloo, 2013-2014

ONGOING PUBLICATIONS

- **Shafii, M.**, Basu, N., Craig, J., Macrae, M.L., Schiff, S., Van Cappellen, P., 2017, "Can Improved Flow Partitioning in Hydrologic Models Increase Biogeochemical Predictability?" WRR, in review.
- **Shafii, M.**, et al., 2017, "Towards hydrological consistency in hydrological modelling: Using snow water equivalent signatures extracted from satellite images", In Preparation.
- **Shafii, M.**, et al., 2017, "Impacts of climate change on nitrogen export in the Grand River Watershed of southwestern Ontario: insights from a coupled process-based model", In Preparation.

RECENT PEER-REVIEWED JOURNAL PUBLICATIONS

- **Shafii, M.**, Basu, N., Craig, J.R., Schiff, S.L. and Van Cappellen, P. (2017), A diagnostic approach to constraining flow partitioning in hydrologic models using a multi-objective optimization framework, Water Resources Research, Accepted, doi:10.1002/2016WR019736
- Liu, H., B. A. Tolson, J. R. Craig, and **M. Shafii** (2016), A priori discretization error metrics for distributed hydrologic modeling applications, Journal of Hydrology, 543, Part B, 873-891
- **Shafii, M.**, and Tolson, B.A., 2015, "Optimizing Hydrological Consistency by Incorporating Hydrological Signatures into Model Calibration Objectives", Water Resources Research, 51(5), 3796-3814, doi: 10.1002/2014wr016520.
- **Shafii, M.**, Tolson, B.A., and Matott, L.S., 2015, "Improving the Efficiency of Monte Carlo Bayesian Calibration of Hydrologic Models via Model Pre-emption", Tech. Note in J. of Hydroinformatics, IN PRESS, doi:10.2166/hydro.2015.043.
- **Shafii, M.**, Tolson, B.A., and Matott, L.S., 2015, "Addressing Subjective Decision-Making Inherent in GLUE-based Multi-Criteria Rainfall-Runoff Model Calibration", J. of Hydrology, 523(0), 693-705, doi:10.1016/j.jhydrol.2015.01.051.
- **Shafii, M.**, Tolson, B.A., and Matott, L.S., 2014, "Uncertainty-based multi-criteria calibration of rainfall-runoff models: A comparative study", Stoch. Environ. Resour. Risk. Assess., 28(6), 1493-1510, doi: 10.1007/s00477-014-0855-x.

RECENT CONFERENCE PROCEEDINGS/PRESENTATIONS

- **Shafii, M.**, Basu, N., Schiff, S.L., Van Cappellen, P., Climatic and physiographic controls on catchment-scale nitrate loss at different spatial scales: insights from a top-down model development approach, Poster at European Geosciences Union (EGU) General Assembly, Vienna, Austria, April 17-22, 2016
- **Shafii, M.**, Basu, N., Craig, J., Schiff, S.L., Van Cappellen, P., and Dürr, H.H., 2015, "Assessment of Hydrological Behaviour of a Snowmelt-Dominated Catchment at Different Scales", Presentation at 2015 Joint Assembly (AGU-GAC-MAC-CG), May 3-7, Montreal, Canada.
- **Shafii, M.**, Basu, N., Craig, J., 2015, "Interactive model evaluation and selection via an optimization-based top-down approach using hydrological signatures", Presentation at European Geosciences Union (EGU) General Assembly, Vienna, Austria, April 13-17, 2015.

LANGUAGES: Persian (Farsi): Native; French: basic

SCHOLARSHIPS AND AWARDS

- Students-nominated best Teaching Assistant Award, Sandford Fleming Foundation, Nov. 2013
- International Doctoral Student Award, University of Waterloo, Sep. 2009 – Aug. 2013
- University of Waterloo Graduate Scholarship, Spring 2010, Fall 2011, Fall 2012, Winter 2013, Spring 2014

GRANTS

- UW Water Institute SEED grant, main applicant receiving funding to run a multi-disciplinary workshop entitled "Stormwater management and nutrients control in extreme events: Knowledge mobilization on the reduction of nutrient loading from urban non-point sources under climate change", April 2017, (16000 CAN\$)
- Research grant for the project 'Multi-criteria calibration of a distrusted hydrologic model using genetic algorithms', Iran Water Resources Management Co., 2009-2014 (~4000 CAN\$)
- Compiled application for and received secure funding to run CWRA-O@UW graduate club, Graduate Students Association, University of Waterloo, 2013 – present (300 CAN\$ per year)

PROFESSIONAL DEVELOPMENT

- TERRE-CREATE short course on Reactive Transport Modeling, University of Waterloo, May 2016
- Attended 'Proactive & Practical Communication' workshop, MITACS, University of Waterloo, Feb. 2013
- Certificate in 'System Analysis, Integrated Assessment and Modelling', Summer School in Environmental Systems Analysis, Dübendorf, Switzerland, Jun. 2009