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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
- Comprehensive identification and evaluation of environmental models using multiple sources of information to measure models predictability
- Discover reliable and optimal solutions in the management of complex water resources systems using state-of-the-art optimization routines

TEACHING INTERESTS

- Teach undergraduate and graduate courses on hydrology, mathematics and statistics, numerical modelling, water resources systems analysis, risk and reliability analysis in engineering, GIS, etc.
- Adopt effective strategies to promote cooperative and active learning in the classroom
- Serving as a teaching coach for students towards career-based success
- Implement techniques to foster creativity among civil and environmental engineering students

SUMMARY OF QUALIFICATIONS

- Ten years of academic experience in research-based projects in water resources engineering
- Expert in watershed modelling and quantitative analysis of hydrological processes through in-depth exploration of field and remote sensing data and models' simulations
- 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 the Nitrogen delivery
- Develop a hydrological signature-based model evaluation routine to identify the most suitable hydrologic model structure in the given watershed and to quantify model structural uncertainty
- Couple a reactive transport component (based on the notion of travel time distribution) to the hydrologic model of the Grand river watershed under direction of supervisors

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

- Lectured on probability, statistics and applications in civil and environmental engineering to classes of 150 2nd year students to enable them to understand and apply statistical solutions to engineering problems
- Developed series of assignments, practice problems and exams, prepared marking schemes and broadcasted them among the team of teaching assistants during weekly meetings
- Supervised Teaching Assistants throughout the term to identify the points of improvement in their work
- Facilitated active learning in the classroom by designing group exercises during lectures
- 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 for the courses:

'Environmental Resources Management' (Fall 2010, Spring 2013)

'Solid Waste Management' (Winter 2011)

'Statistics for Engineers' (Winter 2012, Fall 2013, Winter 2013)

- Lectured occasionally on different topics to enable students to understand the course contents
- Delivered weekly tutorials as well as helping sessions before midterm and final exams
- Collaborated on the development of problems and solutions for assignments and exams
- Marked the students' printed and online assignments to provide constructive feedback
- Guided students research activities to provide suggestions for improving their term projects
- Communicated with students during office hours to clarify the course contents and to address their issues about their assignment markings
- 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

  Program consisted of three courses:

  Preparing for university teaching: composed of multiple workshops including 'teaching large classes', 'teaching and learning styles, 'effective lesson plans', 'dealing with classroom disruptions', etc.

  Preparing for an academic career: a research project about a teaching in higher education

  Teaching practicum: composed of two teaching observations and response papers
- '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

TUTORING

- Tutor in residence for mathematics courses, Village 1, University of Waterloo, Fall 2010 – Spring 2013
- Tutor in Office for Persons with Disabilities for math/statistics, University of Waterloo, Oct. 2012 – Sep. 2013

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 (CE^2GA)', University of Waterloo, May 2012 – Aug. 2014
- *Graduate student member* at 'Faculty of Engineering Council Meetings', University of Waterloo, 2013-2014

COMMUNITY INVOLVEMENT

- *Volunteer judge* at the 'Science Fair' for Grade 8 at Centennial Public School (Waterloo), Feb. 2014

INDUSTRY EXPERIENCE

WATER RESOURCES ENGINEER

MOSHANIR Power Engineering Consultants (www.moshanir.com), Tehran, Iran, 2005-2007

- Performed modelling and numerical analyses to find optimal strategies for operation of large dams and hydro-power plants, and improved the operation efficiency of multi-reservoir systems
- Proposed detailed quotations and tenders for the water resources department to attract new clients

RIVER ENGINEER

YEKOM Consulting Engineers (www.yekom.com), Tehran, Iran, 2003-2005

- Visited the field for evaluating the reports and maps produced by the surveying group
- Prepared all the information required for hydraulic analysis of river systems
- Utilized engineering softwares GIS and HEC-RAS to delineate river banks in floodplain mapping studies

PEER-REVIEWED JOURNAL PUBLICATIONS

- **[A1] 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.
- **[A2] 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.
- **[A3] 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.
- **[A4] 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.
- **[A5]** Afshar, A., **Shafii, M.,** and Bozorg Haddad, O., 2011, "Optimizing Multi-Reservoir Operation Rules; An improved HBMO Approach", J. of Hydroinformatics, 13(1), 121-139, doi: 10.2166/hydro.2010.061.
- **[A6] Shafii, M.** and De Smedt, F., 2009, "Multi-objective calibration of a distributed hydrological model (WetSpa) using a genetic algorithm", Hydrol. Earth Sys. Sci., 28(6), 1493-1510, doi: 10.5194/hess-13-2137-2009.

CONFERENCE PROCEEDINGS/PRESENTATIONS/POSTERS

- **[B1] 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.
- **[B2] 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.
- **[B3] Shafii, M.,** and Tolson, B.A., 2014, "Many-Criterion Calibration of Hydrologic Models Using Hydrological Signatures", Poster at AGU Fall Meeting, December 15-19, 2014, San Francisco, California, USA.

- **[B4] Shafii, M.,** and Tolson, B.A., 2014, "Enhancing Calibration and Uncertainty Analysis in Rainfall-Runoff Modeling through Multi-Objective Optimization", Presentation at 2014 Canadian Water Resources Association Congress, June 2-4, Hamilton, ON, Canada.
- **[B5] Shafii, M.,** Tolson, B.A., Matott, L. S., 2013, "Developments on informal approaches to multi-criteria calibration and uncertainty analysis of hydrologic models", Presentation at 2013 American Geosciences Union Fall Meeting, San Francisco, USA, December 9-16, 2013.
- **[B6] Shafii, M.**, Tolson, B.A., and Matott, L.S., 2012, "Multi-objective calibration and uncertainty analysis of hydrologic models; A comparative study between formal and informal methods", Poster at European Geosciences Union (EGU) General Assembly, Vienna, Austria, April 22-27, 2012.
- **[B7] Shafii, M.,** Tolson, B.A., Matott, L.S., Vrugt, J., and De Smedt, F., 2010, "Application of a MCMC sampler for calibration and uncertainty analysis of a distributed rainfall-runoff model (WetSpa)", Presentation at Water 2010: Hydrology, Hydraulics and Water Resour. in an Uncertain Environ., Quebec City, July 5-7.
- **[B8] Shafii, M.,** Vrugt, J., Tolson, B.A., and Matott, L.S., 2009, "Enhancing multi-objective evolutionary algorithm performance with Markov Chain Monte Carlo", Poster at 2009 American Geophysical Union Fall Meeting, San Francisco, CA, USA, Dec. 14-18.
- **[B9] Shafii, M.,** and De Smedt, F., 2009, "Addressing Identifiability and Equifinality in Calibration of a Distributed Rainfall-Runoff Model Using GAs", Proc. of 8th Intern. Cong. on Civil Eng., Shiraz, Iran.
- **[B10] Shafii, M.,** and De Smedt, F., 2009, "Multicriteria Decision Making under Uncertainty in Rainfall-Runoff Calibration; A Fuzzy Compromise Programming Approach", Proceedings of World Environmental and Water Resources Congress, Kansas City, Missouri, the United States.
- **[B11] Shafii, M.,** Bozorg Haddad, O., and Afshar, A., 2007, "*Evaluation of Performance of Improved HBMO Algorithm in Optimization of Reservoir Operation*", Presentation at 7th River Engineering International Conference, Ahvaz, Iran, February, 2007.
- **[B12] Shafii, M.,** Bozorg Haddad, O., and Afshar, A., 2006, "Optimum Planning of Levee for River Protection in Downstream of Large Dams; A New GA Approach (CPGA)", Proceeding of Twenty-Second International Congress on Large Dams, ICOLD, Barcelona, Spain, pp. 383-396, June, 2006.
- **[B13] Shafii, M.,** Bozorg Haddad, O., and Afshar, A., 2005, "Optimizing Ajichai Flood Levee's Encroachment; A GA Approach", WSEAS Transactions of Information Science and Applications, 5(2), 611-617.

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

- 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$)
- Research Travel Assistantship, Grad. Studies Endow. Fund, University of Waterloo, Fall 2009 (300 CAN$)
- 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

- 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