

Masoud Asadzadeh

PhD, Assistant Professor, Civil Engineering Department, University of Manitoba
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Masoud.Asadzadeh@umanitoba.ca

Research Interests

- Watershed Modelling
- Model Calibration
- River-Reservoir Systems Operation
- Uncertainty Analysis in River-Reservoir Systems Operation
- Water Distribution System Analysis and Optimal Design
- Heuristic Optimization and Algorithm Development and Testing
- High Performance Computing and its Application in Water Resources Engineering

Education

Doctor of Philosophy, Civil and Environmental Engineering, Water Resources | Nov. 12

University of Waterloo, Waterloo, Ontario

Thesis: Developing Parsimonious and Efficient Algorithms for Water Resources Optimization Problems

Advisors: Dr. Bryan A. Tolson and Dr. Donald H. Burn

Fundamentals of University Teaching Certificate | Jul. 11

University of Waterloo, Waterloo, Ontario

Attended training workshops and taught in 20-minute micro teaching sessions in front of teaching critics

Master of Science: Civil and Environmental Engineering, Water Resources | Oct. 04

Amirkabir University of Technology (Tehran Polytechnic), Tehran, Iran

Thesis title: Application of Conflict Resolution Models in Water Resources Allocation

Advisor: Dr. Mohammad Karamouz

Bachelor of Science, Civil Engineering | Jun. 01

Isfahan University of Technology, Isfahan, Iran

Computer/Programming Skills

Advanced in SWAT, ArcSWAT, and MWSWAT

Intermediate in GIS software packages ArcMap and MapWindow

Intermediate in EPANET 2.0

Advanced in MATLAB and OCTAVE

Working knowledge in FORTRAN

Advanced in all aspects of MS Windows and MS Office

Honours, Awards, and Fellowships

Environmental Modelling and Software Outstanding Reviewer Award | 2014

Natural Sciences and Engineering Research Council of Canada, NSERC-VF | Dec. 12 – Jun 15

Ontario Graduate Scholarship, OGS | May 11 – May 12

University of Waterloo President's Graduate Scholarship | May 11 – May 12

University of Waterloo Graduate Scholarship | 7/15 terms in PhD

University of Waterloo Special Graduate Student Entrance Award | September 07

Isfahan University of Technology Brilliant Students Scholarship | Sep. 01 – May 02

Research and Work Experience

Assistant Professor, Civil Engineering, University of Manitoba

| Jul. 15 – Present

- To build an outstanding teaching dossier.
- To train graduate students.
- To develop a research profile that is recognized both nationally and internationally.
- To give service at the department and the university levels.

Post-doctoral Fellow, Department of Geography, University of Guelph | Dec. 12 – Jun. 15

- Set up Soil and Water Assessment Tool (SWAT) for the Rouge River watershed by ArcSWAT.
- Collected measured data including DEM, meteorological data, and flow and water quality.
- Defined the land-use and land management classes to accurately emulate the crop rotation, tillage and fertilizer application rates reported in the Agricultural Census and Statistics Canada.
- Calibrated SWAT against measured flow and water quality constituents.
- Showed that the calibrated model with proper land-use and land management settings can accurately perform in a new case study, the Duffins Creek watershed.
- Studied a reforestation scenario to assess the impact of increasing the natural land cover on alleviating the peak flows and reducing the water quality constituents delivered into the Lake Ontario.
- Wrote the technical report of the modelling and calibration part of the project.
- Drafted two manuscripts for the internal review process in Environment Canada and will submit them to the suitable journals after the internal review process is completed.

Research Assistant, Civil & Env. Eng., University of Waterloo

| Sep. 07 – Oct. 12

- Developed Pareto Archived Dynamically Dimensioned Search (PA-DDS), an efficient multi-objective optimization algorithm that has only one parameter to diminish user's time and effort for tuning algorithm parameters. PA-DDS can solve problems with many objective functions and with real, discrete, or mixed decision variables.
- Developed a specialized version of PA-DDS for solving multi-objective optimization problems with convex trade-off such as hydrologic model calibrations.
- Set up and solved the multi-objective version of SWAT2000 hydrologic model calibration for Town Brook, a sub-watershed in the Cannonsville watershed.
- Developed Hybrid Discrete DDS (HD-DDS), a highly efficient single objective optimization algorithm for solving water distribution system problems with discrete decision variable values.
- Studied the feasibility of restoring Lakes Michigan and Huron surface elevation. Results showed restoration is possible and reveals some benefits and costs, and both positive and negative environmental impacts.
- Solved the multi-objective optimization problem of new operation rule curves for Great Lakes – St. Lawrence river-reservoir system. Results showed that the new regulations can simultaneously reduce the frequency of extreme water levels and magnitude of extreme violations.
- Solved the multi-objective optimization of Lake Superior regulation by linking the Shared Vision Model, Great Lakes simulation model and PA-DDS.
- Set up and solved the bi-objective calibration of the Quebec City water distribution system by PA-DDS and obtained a better solution compared to the solution of the single objective optimization approach in terms of the accuracy of simulating the system behaviour.
- Solved the Battle of Water Calibration Networks problem by collecting data, developing methodologies, setting up and solving the problem, analysing results, writing and presenting the report (conference paper), and reviewing and commenting on the final report (journal paper). Based on all evaluation metrics, my approach was among top seven groups and in one of the metrics it became the 3rd best among all 14 participating groups.

List of Publications

Peer-Reviewed Journal Articles

1. Asadzadeh M., Leon L., Yang W., Bosch D. 2016. *One-day offset in daily hydrologic modeling: An exploration of the issue in automatic model calibration*. Journal of Hydrology, 534, pp. 164-177.
2. Asadzadeh M., Leon L., McCrimmon R. C., Yang W., Liu Y., Wong I., Fong P., Bowen G. *Watershed derived nutrients for Lake Ontario inflows: Model calibration considering typical land operations in Southern Ontario*. Journal of Great Lakes Research, 41(4), pp. 1037-1051.
3. Delisle F. J., Rochette S., Pelletier G., Asadzadeh M., Tolson B. A., and Rodriguez M. J., 2015. *Minimizing Water Residence Time in Quebec City's Main Distribution Network Using Hybrid Discrete Dynamically Dimensioned Search (HD-DDS). PART II*. Journal of Water Supply: Research and Technology – AQUA, 64 (3), pp. 378–390.
4. Asadzadeh M., Tolson B. A., and Burn D. H., 2014. *A New Selection Metric for Multi-Objective Hydrologic Model Calibration*. Water Resources Research, 50(9), pp. 7082–7099.
5. Razavi S. S., Asadzadeh M., Tolson B. A., Fay D., Moin S., and Bruxer J., 2014. *Evaluation of New Control Structures for Regulating the Great Lakes System: A Multi-scenario, Multi-reservoir Optimization Approach*. ASCE, Water Resources Planning and Management, 140(8).
6. Asadzadeh M., Razavi S. S., Tolson B. A., and Fay D., 2014. *Pre-emption Strategies for Efficient Multi-Objective Optimization: Application to the Development of Lake Superior Regulation Plan*. Environmental Modelling & Software, 54, pp. 128-141.
7. Asadzadeh M., and Tolson B. A., 2013. *Pareto Archived Dynamically Dimensioned Search with Hypervolume Based Selection for Multi-Objective Optimization*. Engineering Optimization, 45(12), pp. 1489-1509.
8. Matott L. S., Tolson B. A., and Asadzadeh M., 2012. *A Benchmarking Framework for Simulation-based Optimization of Environmental Models*. Environmental Modelling & Software, 35, pp. 19-30.
9. Asadzadeh M., and Tolson B. A., 2012. *Hybrid Pareto archived dynamically dimensioned search for multi-objective combinatorial optimization: application to water distribution network design*. Hydroinformatics, 14(1), pp. 192-205.
10. Tolson B. A., Asadzadeh M., Maier H. R., and Zecchin A., 2009. *Hybrid discrete dynamically dimensioned search (HD-DDS) algorithm for water distribution system design optimization*. Water Resources Research, 45(12), W12416.

Other Refereed Publications

1. Marchi A., et al., 2013. *The Battle of the Water Networks II (BWN-II)*. ASCE, Water Resources Planning and Management, Posted ahead of print: 18 May 2013.
2. Ostfeld A., et al., 2012. *The Battle of the Water Calibration Networks (BWCN)*. ASCE, Water Resources Planning and Management, 138(5), 523-532.
3. Tolson B. A., Asadzadeh M., and Razavi S. S., 2011. Chapter 3: *Restoration Modelling*. In Stakhiv G. and Moin S. (editors), *Options for Restoring Lake Michigan-Huron Water Levels: An Exploratory Analysis*. Tech. Report for IUGLS. May 26, 2011, pp. 17-35.
4. Tolson B. A., Razavi S. S., and Asadzadeh M., 2011. *Formulation and Evaluation of New Control Structures in the Great Lakes System*. Tech. Report for IUGLS-IJC Study. May, 9, 2011, 50 pages.

Selected Conference Publications and Presentations

1. Asadzadeh M. 2016. *Desired Precision in Multi-Objective Optimization: Epsilon Archiving or Rounding Objectives?* Accepted to be presented in 8th International Congress on Environmental Modelling and Software, Toulouse, France, July 2016.
2. Asadzadeh M., Leon L., McCrimmon R. C., Yang W., Liu Y., Wong I., Fong P., Bowen G., 2015. *Modeling Watershed-Derived Nutrient Loads for Lake Inflows: Application Considering Typical Land Operations in Southern Ontario*. Accepted to be presented at Latornell Conservation Symposium, Nov. 17 to 19, 2015, Alliston, ON, Canada.

3. Asadzadeh M., Leon L., and Yang W., 2014. *One-Day Offset between Simulated and Measured Daily Hydrographs: An Exploration of the Issue in Automatic Model Calibration*. AGU Fall Meeting, December 15-19, 2014, San Francisco, California, USA.
4. Tolson B. A., and Asadzadeh M., 2014. *A New Selection Metric for Multi-Objective Hydrologic Model Calibration*. AGU Fall Meeting, December 15-19, 2014, San Francisco, California, USA.
5. Asadzadeh M., Yang W., Liu Y., Leon L., and Booty W., 2014. *Modified SWAT Model for Cold Climate of Canada: Application to a Watershed in Southern Ontario*. Accepted for an oral presentation in the Canadian Water Resources Association conference, June 2-4, 2014, Hamilton, Ontario, CA.
6. Asadzadeh M., Razavi S. S., Tolson B. A., Fay D., Werick W., and Fan Y., 2012. *A New Rule Curve Based Regulation Plan for Lake Superior*. International Association for Great Lakes Research (IAGLR 2012), May 13-17, 2012, Cornwall, Ontario, Canada, (oral presentation).
7. Asadzadeh M., Razavi S. S., and Tolson B. A., 2011. *Multi-objective Lake Superior Regulation*. AGU Fall Meeting, December 5-9, 2011, San Francisco, California, USA, (poster presentation).
8. Asadzadeh M., Tolson B. A., and McKillop R., 2010. *A Two Stage Optimization Approach for Calibrating Water Distribution Systems*. In Lansey K., Choi C., Ostfeld A., and Pepper I. (editors), Proc., 12th water distribution systems analysis symposium, (WDSA 2010 - Battle of Water Calibration Networks), September 12-15, 2010, Tucson, Arizona, USA, (full paper, oral presentation).
9. Asadzadeh M., Tolson B. A., Pelletier A. G., Delisle F. J., and Rodriguez M. J., 2010. *Bi-Objective Calibration of Quebec City Water Distribution Network*. Hydrology, Hydraulics and Water Resources in an Uncertain Environment (Water 2010), Quebec City, QC, Canada, (oral presentation).
10. Asadzadeh M., and Tolson B. A., 2009. *A New Multi-Objective Algorithm, Pareto Archived DDS*. Proc., 11th Annual Conference Companion on Genetic and Evolutionary Computation Conference: Late Breaking Papers (GECCO'09), Jul. 8-12, 2009, Montreal, Canada. ACM, NY, USA, pp. 1963-1966, (paper, oral presentation).

Teaching Experience

Instructor, University of Manitoba

| Fall 15 – present

- Graduate Level: CIVL7090 Water Resources Systems
- Undergraduate Level: CIVL 2780 Civil Engineering Systems
- Developed Course notes/presentations
- Designed assignments
- Designed exams

Sessional Lecturer, University of Waterloo

| Fall 09

- Taught “Optimization Methods for Stochastic Systems” to 4th year undergraduate students
- Drew students’ attentions to each session title by connecting it to real-life problems or playing relevant games
- Divided students’ activities into individual tasks including term project and midterm (more theory) exam and group works including assignments and final (more application) project
- Motivated students to discuss their results by defining a discussion section in marking scheme
- Defined a term project to let students connect their areas of interest to the course materials
- Designed the final take-home project as a small, real-life optimization scenario to determine if students can apply their knowledge from the course in a new problem

Sessional Lecturer, Water and Electric Industry College in Iran

| Spring 05

- Taught the “Statics and Mechanics of Materials” course to 40 undergraduate level students
- Drew students’ attentions to new titles by explaining its connection to other courses in college
- Motivated students to discuss their result by defining a discussion section in the marking scheme

Other Relevant Experience

- Invited steering committee member to give my technical support and expertise to Mowat Centre for addressing extreme water levels in Great Lakes-St. Lawrence basin | 2014 - 2015
- Invited Speaker, Toronto and Region Conservation Authority, presented results of my post-doctoral research work for managers and senior staff of Parks Canada who were interested in the results of modelling research related to the Rouge park | August 2014

Reviewer of Peer-Reviewed International Journals

| 2010 - Present

- Water Resources Research
- Journal of Hydrology
- Journal of American Water Resources Association
- Journal of Great Lakes Research
- Environmental Modelling & Software
- Environmental Modelling & Assessment
- ASCE Journal of Water Resources Planning and Management
- ASCE Journal of Computing in Civil Engineering
- Journal of Hydroinformatics
- Advances in Artificial Intelligence

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