

MOHAMAD EL GHARAMTI

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EXPERTISE AND RESEARCH AREA

I have expertise in sequential/variational data assimilation (DA), particularly the ensemble Kalman filter. My main interests include filtering and smoothing to state-parameters estimation problems in geosciences. I have six years of DA experience in various applications including: hydrology, petroleum engineering, oceanography and ecosystems. Current work focuses on theoretical developments and atmospheric applications.

PROFESSIONAL EXPERIENCE

Scientist I, National Center for Atmospheric Research Sep 2016 – Present
Post-Doctoral Researcher, Nansen Environmental and Remote Sensing Center Feb 2015 – Aug 2016
Visiting PhD Researcher, Massachusetts Institute of Technology Apr 2014 – Jun 2014
Visiting PhD Researcher, Deltares and Delft University of Technology Sep 2012 – Feb 2013

EDUCATION

King Abdullah University of Science and Technology, Thuwal, Saudi Arabia

- *PhD*, Earth Sciences and Engineering [GPA: 3.93/4.00] Feb 2011 – Dec 2014
- *MS*, Earth Sciences and Engineering [GPA: 3.96/4.00] Sep 2009 – Jan 2011

Middle East Technical University, Ankara, TURKEY

- *BS Major*, Geological Engineering [GPA: 3.70/4.00] Sep 2005 – Jun 2009
- *BS Minor*, Remote Sensing and Geographic Information Systems Sep 2007 – Jun 2009

INTERNSHIPS

Subsurface Modeler | ICES, UT Austin – Texas, USA Jun – Sep 2010
Hydrologist 9/29/16 | Al-Wehdah Dam Project, OZALTIN – Irbid, JORDAN Jul – Aug 2008
Geologist | Al-Wehdah Dam Project, TEMSON – Ankara, TURKEY Aug – Sep 2007

ADMINISTRATIVE EXPERIENCE

Graduate Counselor | Saudi Initiatives, KAUST – Thuwal, KSA Dec 2011 – May 2012
Interpreter-Translator | United Nations, UNHCR – Ankara, TURKEY Mar – Jul 2009

TEACHING EXPERIENCE

Graduate Teaching Assistant, King Abdullah University of Science and Technology

- *AMCS/ErSE 213: Inverse Problems* Spring 2011, 2012, 2013, 2014
- *ErSE 353: Data Assimilation* Fall 2012, 2014
- *ErSE 253: Data Analysis in Geosciences* Spring 2011, 2013
- *AMCS 206: Introduction to Numerical Methods for Engineers* Fall 2010

INVITED TALKS AND SEMINARS

- NERSC, Bergen, NORWAY (Feb 2016) “Tuning Ocean Biogeochemical Parameters using Ensemble Estimation Techniques: Application to Station M”

- NCAR, Boulder (CO), USA (Dec 2015) “Efficient Ensemble State-Parameters Estimation Techniques: Application to Ocean Ecosystem Models”
- MIT, Cambridge (MA), USA (May 2014) “Recent Applications of Data Assimilation for State-Parameters Estimation in Subsurface Hydrology”
- Delft University, Delft, HOLLAND (Dec. 2013) “An Adaptive Hybrid EnKF-OI for Efficient Dual State-Parameters Estimation of Subsurface Contaminant Transport Models”
- ARAMCO, Dhahran, KSA (Oct. 2013) “Efficient Ensemble Kalman Filtering for State-Parameter Estimation in Subsurface Reservoir Models”

JOURNAL PUBLICATIONS

14. Ghostine, R., **Gharamti, M.E.**, Bur, N., Fahs, M., Feugeas, F. and Hoteit, I. (2016) “Bayesian Inference for Assessing the Effect of GGBS Proportion on Concrete Micro-Structure Characteristics” Submitted
13. **Gharamti, M.E.**, Tjiputra, J., Bethke, I., Samuelsen, A., Skjelvan, I., Bentsen, M. and Bertino, L. (2016) “Ensemble Data Assimilation for Ocean Biogeochemical State and Parameters Estimation at Different Sites” Under Revision
12. **Gharamti, M.E.**, Samuelsen, A., Bertino, L., Simon, E., Korosov, A. and Daewel, U. (2016) “Online Tuning of Ocean Biogeochemical Model Parameters using Ensemble Estimation Techniques: Application to a one-dimensional Model in the North Atlantic” Under Revision
11. **Gharamti, M.E.**, Valstar, J., Janssen, G. and Hoteit, I. (2016) “On the efficiency of the hybrid and the exact second-order sampling formulations of the EnKF: A reality-inspired 3D test case for estimating biodegradation rates of chlorinated hydrocarbons at the port of Rotterdam” Accepted
10. Boujema, F.A., **Gharamti, M.E.** and Hoteit, I. (2016) “A Bayesian Consistent Dual Ensemble Kalman Filter for State-Parameter Estimation in Subsurface Hydrology” *Hydrology and Earth System Sciences*, 20, 3289-3307.
9. Liu, B., **Gharamti, M.E.** and Hoteit, I. (2016) “Assessing Clustering Strategies for Gaussian Mixture Filtering a Subsurface Contaminant Model” *Journal of Hydrology*, 535, 1-21.
8. **Gharamti, M.E.**, Boujema, F.A. and Hoteit, I. (2015) “An iterative ensemble Kalman filter with one-step-ahead smoothing for state-parameters estimation of contaminant transport models” *Journal of Hydrology*, 527, 442-457
7. Hoteit, I., Pham, D.T., **Gharamti, M.E.** and Luo, X. (2015) “Mitigating Observation Perturbation Sampling Errors in the Stochastic EnKF” *Monthly Weather Review*, 143, 2918-2936
6. **Gharamti, M.E.**, Valstar, J. and Hoteit, I. (2014) “An adaptive hybrid EnKF-OI scheme for efficient state-parameter estimation of reactive contaminant transport models” *Advances in Water Resources*, 71, 1-15
5. **Gharamti, M.E.**, Kadoura, A., Valstar, J., Sun, S. and Hoteit, I. (2014) “Constraining a Compositional Reservoir Flow Model with Flow-Chemical Data using an Ensemble-based Kalman Filter” *Water Resources Research*, 50 (3), 2444-2467
4. **Gharamti, M.E.** and Hoteit, I. (2014) “Complex Step-based Low-Rank Extended Kalman Filtering for State-Parameter Estimation in Subsurface Transport Models” *Jour. of Hydrology*, 509, 588-600
3. **Gharamti, M.E.**, Hoteit, I. and Valstar, J. (2013) “Dual States Estimation of a Subsurface Flow-Transport Coupled Model using Ensemble Kalman Filtering” *Advances in Water Resources*, 60, 75-88
2. Altaf, U.M., **Gharamti, M.E.**, Hoteit, I. and Heemink, A. (2013) “A Reduced Adjoint Approach to Variational Data Assimilation” *Computer Methods in Applied Mechanics and Engineering*, 254, 1-13
1. **Gharamti, M.E.**, Hoteit, I. and Sun, S. (2012) “Low-Rank Kalman Filtering for Efficient State Estimation of Subsurface Advective Contaminant Transport Models” *Journal of Envir. Eng.*, 138(4), 446-457

BOOK CHAPTERS / PROCEEDINGS

3. **Gharamti, M.E.**, Marzouk, Y.M., Huan, X. and Hoteit, I. (2015) “A Greedy Approach for Placement of Subsurface Aquifer Wells in an Ensemble Filtering Framework” *LNCS*, 8964, 301-309
2. **Gharamti, M.E.**, Ait-El-Fquih, B. and Hoteit, I. (2015) “A One-Step-Ahead Smoothing-based Joint Ensemble Kalman Filter for State-Parameters Estimation of Hydrological Models” *LNCS*, 8964, 207-214
1. **Gharamti, M.E.**, Hoteit, I. and Valstar, J. (2012) “A Dual Ensemble Kalman Filtering for Assimilation into a Coupled Contaminant Model” *Water Resources Proceedings - UIUC*

CONFERENCES AND WORKSHOPS

- Oral presentation, Joint DA-TT & MEAP-TT Workshop, Santa Cruz - CA, USA (July 2016) "Ocean Biogeochemical State-Parameters Estimation within the Norwegian Earth System Model: Ensemble Techniques and 1D Assimilation at Different Latitudes"
- Oral presentation, 11TH International EnKF Workshop, Ulvik, Norway (June 2016) "A One-Step-Ahead Smoothing formulation of the EnKF: Application to State-Parameters Estimation for Ocean Ecosystems in the North Atlantic"
- Oral presentation, EVA all-staff meeting, Oslo, Norway (April 2016) "Tuning Ocean Biogeochemical Parameters using a coupled HAMOCC-EnKF Framework: Application to Stations MIKE, BATS, HOT"
- Oral presentation, FortHjort Seminar on Ecosystem Modeling, Bergen, Norway (Feb. 2016) "Tuning Ocean Biogeochemical Parameters using Ensemble Estimation Techniques: Application to Station M"
- Oral presentation, 10TH International EnKF Workshop, Flam, Norway (June 2015) "Monitoring and Predicting Subsurface Organic Contaminants in the Port of Rotterdam using a Hybrid Ensemble Kalman Filter"
- Poster presentation, 10TH International EnKF Workshop, Flam, Norway (June 2015) "A New Dual Ensemble Kalman Filter for State-Parameters Estimation in Subsurface Hydrology"
- Oral presentation, 10TH Adjoint Workshop, West Virginia, USA (June 2015) "Ensemble Strategies for State-Parameters Estimation in Ocean Ecosystem Models"
- Oral presentation, Dynamic Data-driven Environmental Systems Science Conference, Cambridge, USA (Nov. 2014) "A Greedy Approach for Placement of Subsurface Aquifer Wells in an Ensemble Filtering Framework"
- Oral presentation, XX International Conference on Computational Methods in Water Resources, Stuttgart, GERMANY (June 2014) "Estimating biodegradation Rates of Chlorinated Hydrocarbons at the Port of Rotterdam using a Hybrid Ensemble Kalman Filter"
- Oral presentation, European Geoscience Union - EGU, Vienna, AUSTRIA (April 2014) "Adaptive Hybrid EnKF-OI for State-Parameters Estimation in Contaminant Transport Models"
- Poster presentation, 2ND International KACST-KAUST-JCCP Workshop on Surface and Subsurface 4D Monitoring, Thuwal, KSA (Mar. 2014) "Calibrating Subsurface Reservoir Models using Joint and Dual Assimilation of Chemical Composition Data"
- Poster presentation, 6TH International Symposium on Data Assimilation, Maryland, USA (Oct. 2013) "Dual State-State Estimation of a Subsurface Flow-Transport Coupled Model using Ensemble Kalman Filtering"
- Oral presentation, 6TH International Conference on Water Resources and Environment Research, Koblenz, GERMANY (June 2013) "Estimation of subsurface aquifer properties in a reservoir compositional flow model using ensemble based joint and dual state-parameter estimation"
- Poster presentation, XIX International Conference on Computational Methods in Water Resources, Illinois, USA (June 2012) "A Dual Ensemble Kalman Filtering for Assimilation into a Coupled Contaminant Model"
- Oral presentation, The 9TH International Workshop on Adjoint Model Applications in Dynamic Meteorology, Sicily, ITALY (Oct. 2011) "Adjoint reduced variational assimilation method with application to groundwater contamination"

TRAINING AND SCHOOLS

- Summer School on Advanced DA for Geoscience: Les Houches, FRANCE (May 2012)
- KAUST-CIMPA Winter School on Uncertainty Quantification: Thuwal, KSA (Jan. 2012)
- Second Summer School on Data Assimilation: Iasi, ROMANIA (July 2011)
- OCCAM, Oxford Center for Collaborative Applied Mathematics: Oxford, UK (Mar. 2011)

EDITORIAL AND JOURNAL POSITIONS

- *Reviewer:* Advances in Water Resources, Water Resources Research, Journal of Hydrology, Journal of Environmental Engineering, Computational Geosciences, Ocean Modelling, Journal of Marine Systems

HARDWARE AND SOFTWARE SKILLS

- *Software:* PETREL, ECLIPSE, MODFLOW, MT3DMS, RT3D, AutoCAD, COMSOL

- *Computer Programming*: Fortran (Parallel computing), shell scripting, SQL, Matlab, R
- *Productivity Applications*: TeX (LaTeX, BibTeX), Vim, most common productivity packages
- *Operating Systems*: Microsoft Windows family, Apple OS X, IBM OS/2 and Linux

AWARDS

King Abdullah University of Science and Technology, Thuwal, Saudi Arabia

- Provost academic excellence award, Ph.D. 2013
- KAUST OCRF funding program, Ph.D. 2011 - 2014
- Highest ranking student certificate, M.S. degree 2009 - 2010
- Provost award for high performance, 2010
- Discovery Scholarship, 2009

Middle East Technical University, Ankara, TURKEY

- Highest-ranked graduate in the history of the Geological Engineering department
- Six high honor and two honor certificates for the academic years, 2005 - 2009
- Turkish government scholarship for higher education, 2006 - 2009

LANGUAGE SKILLS

- *Arabic*: Native or Mother tongue
- *English*: Fluent, bilingual speaking, reading and writing
- *Spanish*: Working Proficiency advanced speaking and reading
- *Turkish*: Intermediate conversational skills and reading ability

REFERENCES

Available upon request

Last Modified: 9/29/16