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Education

2012-2016

Ph.D. in computer science, Virginia Polytechnic institute and state university (V-Tech), Blacksburg, VA, Unites States.

- **Area of Concentration:** uncertainty quantification, and data assimilation.

1999-2008

Bachelor and Master of mathematics, statistics and computer science, Mansour University, Egypt.

- **Master Thesis Title:** Data Mining Algorithms using Artificial Neural Networks (ANNs).

Work Experience

08/ 2017 – Present

Postdoctoral Researcher, Mathematics and Computer Science (MCS) department, Argonne National Laboratory (ANL), Lemont, IL, United States.

- **Responsibilities:** develop scalable computational algorithms, and software tools, for large-scale problems with applications to energy problems.

08/ 2016 – 07/ 2017

SAMSI Postdoctoral Research Fellow, Statistics and Applied Mathematical Science Institute (SAMSI), Research Triangle Park, Durham, NC.

- **Responsibilities:** developed efficient algorithms for experimental design and sensor placement.

08/ 2016 – 07/ 2017

Postdoctoral Research Fellow, Mathematics department, North Carolina State University (NCSU), Raleigh, NC.

Fall 2015 – Spring 2016

Teaching Assistant, Computer Science department, Virginia Polytechnic Institute and State University (Virginia-Tech), Blacksburg, VA.

- **Responsibilities:** Assisted with teaching and grading several courses including “numerical methods” and “data and algorithm analysis.

2004 –2011

Demonstrator, and Assistant Lecturer, Mathematics department, Faculty of science, Mansoura University, Egypt.

- **Responsibilities:** Assisted with teaching and grading several courses for both undergraduate, and graduate students, in Math, Statistics, and Computer Science majors.

06/2015 –08/2015

Summer Intern, Mathematics and Computer Science (MCS) department, Argonne National Laboratory, Lemont, IL.

- **Project:** DAPack: an extensible data assimilation testing suite
- **Supervisor:** Dr. Emil Constantinescu (<http://www.mcs.anl.gov/~emconsta/>)

06/2014 –08/2014

Summer Intern, Mathematics and Computer Science (MCS) department, Argonne National Laboratory, Lemont, IL.

- **Project:** Optimization methods for importance sampling.
- **Supervisor:** Dr. Mihai Anitescu. (<http://www.mcs.anl.gov/~anitescu/>)

**Current
Research
Interests**

Inverse Problems, Data Assimilation, Uncertainty Quantification, Optimal Design of Experiments, High Performance Computing and Parallel Programming.

Articles and Publications

1. Attia, A. and Constantinescu, E., 2018. An Optimal Experimental Design Framework for Adaptive Inflation and Covariance Localization for Ensemble Filters. Under review; Monthly Weather Review (MWR). ArXiv preprint arXiv:1806.10655.
2. Moosavi, A., Attia, A., and Sandu, A., 2018. A Machine Learning Approach to Adaptive Covariance Localization. Under review; SIAM Journal on Uncertainty Quantification (JUQ). ArXiv preprint arXiv:1801.00548.
3. Attia, A. and Sandu, A., 2018. DATeS: A Highly-Extensible Data Assimilation Testing Suite. Under review; Geoscientific Model Development (GMD). arXiv preprint arXiv:1704.05594.
4. Attia, A., Alexanderian, A. and Saibaba, A., 2018. Goal-Oriented Optimal Design of Experiments for Large-Scale Bayesian Linear Inverse Problems. *Inverse Problems*, Vol . 34, Number 9, Pages 095009.
5. Attia, A., Moosavi, A. and Sandu, A., 2018. Cluster Sampling Filters for Non-Gaussian Data Assimilation. *Atmosphere*, 9(6).
6. Attia, A., Ștefănescu, R. and Sandu, A., 2017. The Reduced-Order Hybrid Monte Carlo Sampling Smoother. *International Journal for Numerical Methods in Fluids*, Vol. 83, Issue 1, January 10.
7. Attia, A., Rao, V. and Sandu, A., 2017. A Hybrid Monte-Carlo Sampling Smoother for Four-Dimensional Data Assimilation. *International Journal for Numerical Methods in Fluids*, Vol. 83, Issue 1, January 10, 2017.
8. Attia, A. and Sandu, A., 2015. A Hybrid Monte Carlo Sampling Filter for non-Gaussian Data Assimilation. *AIMS Geosciences*, 1 (1): 41-78, 2015.
9. Attia, A., Rao, V. and Sandu, A., 2015. A Sampling Approach for Four-Dimensional Data Assimilation. In *Dynamic Data-Driven Environmental Systems Science*, Eds: S. Ravela and A. Sandu (pp. 215-226). Springer, Cham, 2015.

Conferences and Talks

1. October 2-4, 2018; ALCF Simulation, Data, Learning workshop, Argonne National Laboratory, USA.
2. September 24-25, 2018; Advanced Statistical Methods Meet Machine Learning Workshop, Argonne National laboratory, USA.
3. September 13-15, 2018; SIAM Conference on Mathematics for Planet Earth) (SIAM-MPE-18).
Talk title: An Efficient Framework for Adaptive Inflation and Covariance Localization in Ensemble Kalman Filtering.
4. April 16-19, 2018; SIAM Conference on Uncertainty Quantification (SIAM-UQ-18). Talk title: Goal-oriented Optimal Design of Experiments for Bayesian Inverse Problems.
5. Jan 16-18, 2018; Deep Learning at Argonne National Laboratory. Building 240, Argonne, TCS1416, S. Cass Ave, IL, USA.
6. June 7-9, 2017; American Institute of Mathematics, AIM. 600 East Brokaw Road, San Jose, CA 95112. Workshop on Careers in Academia.
7. May 14-19, 2017; SAMSI/NCSU Undergraduate Workshop. NWP-Project Proposal; Data Assimilation for Numerical Weather Prediction.
8. May 1, 2017; SAMSI; Statistical and Applied Mathematical Science Institute. OPT- Program Transition Workshop. Talk title: Goal-Oriented Optimal Design of Experiments for Bayesian Linear Inverse Problems.
9. April 6-7, 2017; National Science Foundation (NSF), 4201 Wilson Blvd, Arlington VA. An examination of data assimilation algorithms, observations, and applications in the context of next-generation computing.
10. March 2017: Workshop on Uncertainty Quantification and Data-Driven Modeling; Austin, Texas, USA. Poster title: Cluster Sampling Algorithms for Non-Gaussian Data Assimilation.

11. March 2017: SAMSI; Statistical and Applied Mathematical Science Institute. Talk title: A Family of Clustering Sampling Smoothers for 4D Non-Gaussian Data Assimilation.
12. February/March 2017: SIAM Conference on Computational Science & Engineering (CSE17), Atlanta, Georgia, USA. Talk title: Cluster Sampling Filters for Non-Gaussian Data Assimilation.
13. February 2017: SAMSI; Statistical and Applied Mathematical Science Institute. E&O: Undergraduate Workshop.
14. February 2017: Workshop on the Interface of Statistics and Optimization (WISO), Duke University, Durham, NC, USA.
15. January 2017: Statistical and Applied Mathematical Science Institute, SAMSI. Workshop on Statistical Inverse Problems. Talk title: Goal-Oriented Optimal Experimental Design; Presentation Slides.
16. December 2016: Argonne National Laboratory, ANL. Talk title: Advanced Sampling Methods for Solving Large-Scale Inverse Problems.
17. August/September 2016: Opening Workshop of the Program on Optimization at SAMSI.
18. SAMSI optimization summer school, August 8-12, 2016. The Hamner Conference Center in Research Triangle Park, NC.
19. Workshop on Sensitivity Analysis and Data Assimilation in Meteorology and Oceanography, Roanoke, West Virginia, USA, Adj. Workshop 2015. Talk title: Efficient Sampling Algorithms for Non-Gaussian Data Assimilation.
20. Summer Argonne Students Symposium (SASSy), 2015. Talk title: DAPACK: A Python Package for Sequential Data Assimilation.
21. SIAM Conference on Computational Science and Engineering, Salt Lake City, Utah, USA, SIAM CSE 2015. Talk title: Efficient Sampling Algorithms for Non-Gaussian Data Assimilation.

22. Dynamic Data-driven Environmental Systems Science conference, Massachusetts Institute of Technology, Cambridge, MA, DyDESS 2014. Presentation & poster title: A Sampling Approach for Four Dimensional Data Assimilation.
23. Summer Argonne Students Symposium (SASSy) 2014, Argonne National Laboratory. Talk title: Derivative-based Solution of the Constrained Optimization Problem(s) with DeMarco's Model.
24. University of Maryland-Virginia Tech Data Assimilation Day, University of Maryland, College Park, UMD-VTech 2014. Presentation Title: A Sampling Filter for Non-Gaussian Data Assimilation.
25. SIAM conference on uncertainty quantification in Savannah, Georgia, SIAM UQ 2014.
26. Sixth International Symposium on Data Assimilation, University of Maryland, College Park, WMO 2013.

Grants and Awards

1. Lead PI of Argonne's Laboratory Directed Research and Development Seed project (LDRD). Project Title: "Goal-Oriented Optimal Experimental Design Framework for Sensor Placement and Acquisition of Highly-Correlated Data". Budget is \$25K per year.
2. Co-PI of LDRD project titled "Statistical Multi-Scale Methods for Parameterization of Complex Physics-Based Models", with budget of \$25K.
3. NSF and AIM Travel Grant to participate in the workshop "Careers in Academia". American Institute of Mathematic, AIM, San Jose, CA, USA. June 2017.
4. NSF Travel Grant to participate in the workshop "An examination of data assimilation algorithms, observations, and applications in the context of next-generation computing". National Science Foundation (NSF), 4201 Wilson Blvd, Arlington VA. April 2017.
5. ICES Travel Grant to participate in "Workshop on Uncertainty Quantification and Data-Driven Modeling". Austin, Texas, USA. March 2017.
6. Argonne National Lab travel grant. Invited Talk title: "Advanced Sampling Methods for Solving Large-Scale Inverse Problems". Argonne National Laboratory, ANL, IL, USA. December 2016

Software Projects

DLiDA: Doppler Lidar Data Assimilation. A PETSc/HyPar-based package for ensemble-based data assimilation of high-resolution wind measurements into a large-scale atmospheric model. *In Development*

DATEs: Advanced Data Assimilation (DA) Testing Suit written mainly in Python but it gives the freedom to combine/glue pieces written in different languages such as models written in Fortran, filters written C, etc.

- **Download and Documentation:**

- <http://people.cs.vt.edu/~attia/DATeS/index.html>

- or <https://sibiu.cs.vt.edu/dates/index.html>

DAPack(PY-DA*): An Extensible Python Package for Data Assimilation.

- **Download and Documentation:**

- <http://www.mcs.anl.gov/~emconsta/DAPackSite/>

Teaching Experience

- **May 14-19, 2017; SAMSI/NCSU Undergraduate Workshop:**

- An Introduction to Data Assimilation and DATEs (Data Assimilation Testing Suite).
 - Hands-on Introduction to Python. See Presentation Slides. Code Snippets.

- **February 2017: SAMSI; Statistical and Applied Mathematical Science Institute. E&O: Undergraduate Workshop.**

- Introduction to Python for Scientists Inverse Problems and Data Assimilation: Hands-On Tutorial.

Community Services

Review papers for journals:

- SIAM Review
- SIAM/ASA Journal on Uncertainty Quantification (JUQ)
- International Journal for Numerical Methods in Fluids (IJNMF)
- Computational Geosciences (COMG)
- Geoscientific Model Development (GMD)
- Ocean Modelling
- Sensors

Skills and Abilities

Computer and programming skills:

- **Programming Tools:** Python, Cython, Fortran, C, C++, C#, Java, VB.
- **Parallel Computation:** MPI, OpenMP, Pthreads.
- **Math/Engineering:** MATLAB, MABLE, MATHEMATICA, MINITAB, SPSS, SAS, R
- **Other Tools:** Subversion Control, HTML, Latex, MS-Office, etc.

Management Skills and Experience

- Leading a group developing “**DATeS**”: an extensible package for experimental data assimilation.
- Mentor undergraduate team project on a project “[Data Assimilation for Numerical Weather Prediction](#)”