Zhonghua Zheng

Ph.D. Candidate
Department of Civil and Environmental Engineering (CEE)
University of Illinois at Urbana-Champaign (UIUC)

Data Scientist Intern
Bayer AG (The Climate Corporation)

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Education

University of Illinois at Urbana-Champaign (UIUC), U.S. Expected 2020
Ph.D. in Environmental Engineering & Computational Science and Engineering (CSE) GPA: 3.80/4.00
-Dissertation: Coupling Data Science and Numerical Simulations to Empower Atmospheric and Environmental Research
-Advisor: Prof. Nicole Riemer (Atmospheric Sciences & NCSA & CEE)
-Committee members: Prof. Lei Zhao (CEE) | Prof. Matthew West (MechSE) | Dr. Valentine Anantharaj (ORNL)
-Passed Qualifying Exam (08/30/2018) and Preliminary Exam (03/28/2019)
-Domain Knowledge: Atmospheric Aerosols, Urban Environment, Agroecosystem
-Ready Knowledge: Data Science, High-Performance Computing (HPC), Simulations

M.S. in Agricultural and Biological Engineering (ABE) 12/2016
-Thesis: Impedance-based moisture content sensor assessment for gas-phase biofilters
-Advisor: Prof. Xinlei Wang
-Committee members: Prof. Richard S. Gates | Prof. Liangcheng Yang (Illinois State University)

Zhejiang University (ZJU), China 06/2015
B.Eng. in Biosystems Engineering (Program Ranking: Top 2 in China) GPA: 3.69/4.00
-Thesis: Investigation on the bactericidal efficacy of atomized slightly acidic electrolyzed water
-Advisor: Prof. Zhangying Ye

University of Manchester, UK 02/2013
Student in University Language Centre (01/2013-02/2013)

Employment

Data Scientist Intern
Bayer AG 09/2018 -
Affiliation: Crop Science Division - Breeding - Analytics and Pipeline Design
The Climate Corporation (Project Sponsor, a subsidiary of Bayer) 09/2018 -
Affiliation: Science - Data Insights & Discovery 01/2019 -
Affiliation: Science - Measurements 09/2018 - 12/2018
Project: *Machine Learning Approaches to Soil Properties Regression*
Mentor: Dr. Huan Gu

Graduate Assistant
Department of Computer Science (CS) at UIUC 08/2018 - 05/2019
Duties: Clerical Support, Technical/Support Services for a CS class with 500 students
Mentor: Prof. Mariana Silva

ORISE Ph.D. Intern/Researcher at ORNL
Oak Ridge National Laboratory (ORNL) 05/2018 - 08/2018
Affiliation: National Center for Computational Sciences - Advanced Data and Workflow Group
Themes: Deep Learning, Computational Science and Engineering, Big Data
Mentor: Dr. Valentine Anantharaj

Data Scientist-UIUC Innovation Center
Monsanto Company 01/2018 - 05/2018
The Climate Corporation (Project Sponsor)

Affiliation (Monsanto Company): GLB Breeding - Analytics & Pipeline Design
Affiliation (The Climate Corporation): Science - Measurements
Project: *Machine Learning Approaches to SmartFirmer Anomaly Detection*
Skills: Machine Learning, Spatiotemporal Analysis, Big Data
Achievements: Got the summer intern (05/2018 - 08/2018) offer, Gave two oral presentations for team
Mentor: Dr. Michael H. Malone

Awards/Honors/Professional Registrations

- ✓ Research Review Outstanding Poster Award, Third Place in Atmospheric Sciences, School of Earth, Society, & Environment, UIUC — 02/2019
- ✓ Travel Grants, 18th Conference on Artificial and Computational Intelligence and its Applications to the Environmental Sciences (18 AI), American Meteorological Society (AMS) 99th Annual Meeting — 12/2018
- ✓ Racheff Graduate Student Travel Award, Department of CEE, UIUC — 10/2018
- ✓ Finalist, SMOKY MOUNTAIN Computational Sciences and Engineering Conference (SMC) Data Challenge — 08/2018
- ✓ Conference Travel Awards for Graduate Students, Graduate College, UIUC — 10/2017
- ✓ Racheff Graduate Student Travel Award, Department of CEE, UIUC — 10/2017
- ✓ Fundamental Engineer (FE) in Environmental Engineering, issued by NCEES — 06/2017
- ✓ First Place, Student Paper Award, Association of Overseas Chinese Agricultural, Biological, and Food Engineers (AOCABFE) — 07/2016
- ✓ ABE Student Travel Grant, Department of ABE, UIUC — 03/2016
- ✓ Tau Beta Pi (Engineering Honor Society) — Inducted 2016
- ✓ Alpha Epsilon (Agricultural Engineering Honor Society) — Inducted 2015
- ✓ Excellent Student, ZJU, China — 11/2014
- ✓ Scholarship for Academic Excellence, ZJU, China — 11/2014

Research Experience

Graduate Research Assistant 01/2019 - Present
Department of Civil and Environmental Engineering at UIUC
Urban Environment & Machine Learning (Mentor & Co-Director of Dissertation Research: Prof. Lei Zhao)

- Leverage Machine Learning, processed-based models, and Remote Sensing to study the urban environment
- Ph.D. dissertation research

Graduate Student Researcher 01/2018 - Present
Department of Atmospheric Sciences (ATMS) at UIUC
Atmospheric Science & Machine Learning (Mentor & Ph.D. Advisor: Prof. Nicole Riemer)

- Leverage Deep Learning frameworks to predict the global distribution of aerosol mixing state metrics
- Build a Neural Network in TensorFlow to fit regression and classification models
- Ph.D. dissertation research

Graduate Research Assistant 08/2016 - 12/2017

Department of Civil and Environmental Engineering at UIUC
Air Quality Modeling (Mentors: Prof. Mark J. Rood & Dr. Sotiria Koloutsou-Vakakis)

- Collaborated with the researchers from the CyberGIS Center for Advanced Digital and Spatial Studies (CyberGIS Center), National Center for Supercomputing Applications (NCSA)
- Attended the professional conference and presented the poster

Graduate Student Researcher 08/2014 - 08/2016

Department of Agricultural and Biological Engineering at UIUC
Environmental Control (Mentors: Prof. Xinlei Wang & Prof. Liangcheng Yang)

- Developed an impedance-based sensor to monitor moisture of biofilter media in different conditions
- Attended the professional conference and gave oral presentation
- M.S. thesis research

Undergraduate Student Researcher 07/2013 - 08/2013

Department of Agricultural and Biological Engineering at UIUC
Indoor Air Quality (Mentors: Prof. Xinlei Wang & Dr. Liangcheng Yang)

- International Summer Immersion Program (ISIP), College of Agricultural Consumer and Environmental Sciences (ACES)
- Completed an independent project titled "*Indoor air quality case study: particle size distribution in a campus building*" and presented the poster

Undergraduate Student Researcher 03/2013 - 06/2014

College of Biosystems Engineering and Food Science at ZJU
Indoor Air Quality (Mentors: Prof. Zhangying Ye)

- Served as a student PI and project lead for the project "Development of a portable fogging device for disinfection with Slightly Acidic Electrolyzed Water"
- Served as a student PI and project lead for the project "Effects of atomized Slightly Acidic Electrolyzed Water on Sterilization effect and PM2.5 concentration in the air"
- B.Eng. thesis research

Research Grants and Contracts

	Project Title	Year	PI /Co-PI	Source	Amount Awarded	Time Period
		Funded				
1)	Development of a portable fogging device for disinfection with Slightly Acidic Electrolyzed Water	2013	PI	Ministry of Education of P.R. China-NTPIEU	~$3,000	1 year
2)	Effects of atomized Slightly Acidic Electrolyzed Water on Sterilization effect and PM2.5 concentration in the air	2013	PI	ZJU-SRTP	~$500	1 year
		Pending				
1)	Integrating numerical modeling and machine learning to understand uncertainties in satellite retrievals of urban aerosols at global scale	2019	Student-PI	NASA-FINESST	$135,000	3 years

Completed Research Projects

Evaluation of WRF Parameterizations for Air Quality Applications 08/2016 - 12/2017

- Simulated meteorological parameters using Weather Research and Forecasting (WRF) model.
- Utilized NCL/Python and CyberGIS-Jupyter framework for geospatial analytics.

Impedance-based moisture content sensor assessment for gas-phase biofilters 12/2014 - 08/2016

- Determined the effects of different size distribution and nitrogen concentration of biofilter media on media impedance by conducting impedance-based sensor tests and analytical chemistry experiments.
- Developed mathematical and statistical models for estimating moisture contents of biofilter media, where the moisture contents are the functions of sensor reading and nitrogen concentration.

Identifying ammonia source and sink profiles within a corn canopy in central Illinois using inverse Lagrangian dispersion analysis (CEE independent study) 08/2015 - 12/2015

- Developed code to perform Inverse Lagrangian modeling for estimating fluxes of ammonia in corn canopy.
- Analyzed the vertical in-canopy ammonia source/sink profile from the in-canopy vertical profile of ammonia concentration using Inverse Lagrangian method.

Development of a portable fogging device for disinfection with Slightly Acidic Electrolyzed Water (granted by Ministry of Education of China) 04/2013 - 06/2014

- Served as a Principal Investigator for a project of National Training Program of Innovation and Entrepreneurship for Undergraduates, NTPIEU ($3,000).
- Designed the equipment planning diagrams, prototype and tested the efficacy of sterilization.
- Evaluated the optimal parameters of device such as electrode spacing for maximum Available Chlorine Concentration (ACC) generation.

2014 ASABE/CSBE Robotics Student Design 03/2014 - 07/2014

- Used Arduino to develop a syrup collecting robotics prototype based on machine vision.
- Implemented SolidWorks and CAD system to design and 3D print robotics component (end-effectors, spooling, and traveling devices).

Effects of atomized Slightly Acidic Electrolyzed Water on Sterilization effect and PM2.5 concentration in the air 03/2013 - 06/2014

- Served as a Principal Investigator for a Zhejiang University Student Research Training Program, SRTP ($500).
- Conducted simulated field trial and quantitative germicidal by using *E.Coli (ATCC 25922).*
- Operated the Six-Stage Andersen Cascade Impactor to collect the microorganism sample and measure the PM2.5 with TSI 8530 in the field trial.

Research Products

(First Author)

Peer-reviewed Journals

[2] Zheng, Z., Yang, L., Gates, R. S., Wu, J., & Wang, X. (2017). **Impedance-based moisture content sensor assessment for gas-phase biofilter media**. *Transactions of the ASABE*, *60(5)*, 2163-2173. doi: 10.13031/trans.12335.

[1] Zheng, Z., Lin, X., Zhu, S., He, J., Cao, Y., & Ye, Z. (2016). **Investigation on the bactericidal efficacy of atomized slightly acidic electrolyzed water**. *Chinese Journal of Disinfection, 33*(4), 312-317. doi: 10.11726/j.issn.1001-7658.2016.04.004. (Peer-viewed, In Chinese)

Thesis

[1] Zheng, Z. (2016). **Impedance-based moisture content sensor assessment for gas-phase biofilters**. Master thesis, Department of Agricultural and Biological Engineering, University of Illinois at Urbana-Champaign.

Technical Reports

[1] Zheng, Z., Riemer, N., West, M., & Anantharaj, V. G. (2019). **Evaluation of machine learning approaches to estimate aerosol mixing state metrics in atmospheric models**. *Oak Ridge National Laboratory (ORNL) Technical Memo*. (Under internal review)

Conference Proceedings

[1] Zheng, Z., Yang, L., & Wang, X. (2016). **Monitoring moisture content of gas-phase biofilter based on impedance under different conditions**. In *2016 ASABE Annual International Meeting, No. 162461021 (*pp. 14*)*. American Society of Agricultural and Biological Engineers. doi:10.13031/aim.20162461021.

(Participant)

Peer-reviewed Journals

[2] Xu, P., Liao, Y., Zheng, Y., Zhao, C., Zhang, X., Zheng, Z., & Luan, S. (2019). **Northward shift of historical methane emission hotspots from the livestock sector in China and assessment of potential mitigation options**. *Agricultural and Forest Meteorology*, *272-273*, 1-11. doi: 10.1016/j.agrformet.2019.03.022.

[1] Fu, K., Zheng, Z., Balasubramanian, S., Yin, D., Koloutsou-Vakakis, S., McFarland, D. M., Wang, S., & Rood, M. J. (2019). **WRF Parameterization for Air Quality Applications over the Midwest USA**. (In preparation)

Presentations

Oral

[4] **Zheng, Z.** (2019). **Machine Learning enabled coarse-grained modeling in Earth System Models**. Oral Presentation in *2019 AEESP Distinguished Lecture & 25th Annual Environmental Engineering & Science Symposium at UIUC*, Champaign, IL., April 19.

[3] **Zheng, Z.** (2017). **Impedance-based moisture content sensor assessment for gas-phase biofilters**. Oral Presentation in *CEE 595 AG Seminar,* Environmental Engineering and Science Program Seminar at UIUC, Urbana, IL., April 20.

[2] **Zheng, Z.** (2016). **Monitoring moisture content of gas-phase biofilter based on impedance under different conditions**. Oral Presentation in *M.S. Thesis Final Defense,* Department of Agricultural and Biological Engineering at UIUC, Urbana, IL., August 26.

[1] **Zheng, Z.**, Yang, L., & Wang, X. (2016). **Monitoring moisture content of gas-phase biofilter based on impedance under different conditions**. Oral Presentation in *2016 ASABE Annual International Meeting,* American Society of Agricultural and Biological Engineers, Orlando, FL., July 20.

Poster

[5] **Zheng, Z.**, Anantharaj, V. G., West, M., & Riemer, N. (2019). **Machine Learning enabled coarse-grained modeling in Earth System Models**. Poster Presentation in *2019 School of Earth, Society and Environment Research Review*, Urbana, IL., February 15.

[4] **Zheng, Z.**, Anantharaj, V. G., Gasparik, J., Curtis, J. H., Yao, Y., Hughes, M. P., Schmidt, D., West, M., & Riemer, N. (2019). **Machine Learning to Predict Multi-Aerosol Mixing State Metrics. Poster Presentation in** *18th Conference on Artificial and Computational Intelligence and its Applications to the Environmental Sciences*, *AMS 99th Annual Meeting*, American Meteorological Society, Phoenix, AZ., January 7.

[3] Zheng, Z., Dash, S., Schmidt, D., Yin, J., Riemer, N., West, M., & **Anantharaj, V. G.** (2018). **A Machine Learning Approach to Estimate Multi-Aerosol Mixing State Metrics at a Global Scale in Earth System Models**. Poster Presentation in *2018 AGU Fall Meeting*, American Geophysical Union, Washington, D.C., December 10.

[2] **Zheng, Z.** & Riemer, N. (2018). **Global Aerosol Mixing State Metrics Distribution Assessment: Artificial Neural Network (ANN) Approaches.** Poster Presentation in *24th Annual Environmental Engineering & Science Symposium at UIUC*, Champaign, IL., April 13.

[1] **Zheng, Z.**, Fu, K., Balasubramanian, S., Koloutsou-Vakakis, S., McFarland, D. M., & Rood, M. J. (2017). **Evaluation of WRF Parameterizations for Air Quality Applications over the Midwest USA**. Poster Presentation in *2017 AGU Fall Meeting*, American Geophysical Union, New Orleans, LA., December 14.

Teaching Experience

Graduate Student Co-Instructor 07/2016 & 07/2017

Girls' Adventures in Math, Engineering, and Science (GAMES) summer camp for high-school female students, UIUC

- Taught Visualization of Environmental Data with ArcGIS.

Graduate Grader 09/2015 - 12/2015

Department of Agricultural and Biological Engineering at UIUC
Grader of TSM 372 - *Environmental Control & HVAC Systems* (TSM 372) with 30 students

- Grade assignments, lab reports, class quizzes and exams
- Assist with classroom and lab activities

Mentoring Experience

[4] **Yilan Cheng (B.S., 2019, expected, Civil Engineering, UIUC)** 06/2017 - 08/2017
Research Experiences for Undergraduates

[3] **Yuchen He (B.S., 2017, M.S., 2018, Computer Science, UIUC)** 08/2016 - 05/2017
Research Experiences for Undergraduates

[2] **Jing Wu (B.A., 2017, M.S, 2020, Agricultural Resources and Environment, ZJU)** 07/2016 - 08/2016
International Summer Immersion Program

[1] **Ciju Francis (B.S., 2015, Electrical Engineering, UIUC)** 02/2015 - 05/2015
ABE 397 - Independent Study

Service / Outreach Activities

2019

Student Volunteer at ISC HIGH PERFORMANCE 2019 – The Event for High Performance Computing, Networking, & Storage, Frankfurt, Germany, 2019

Midwest Student Conference on Atmospheric Research (MSCAR) Planning (Outreach) Committee

2015 - 2016

Executive Board & Activity Director, Student Activity Committee (SAC), Association of Overseas Chinese Agricultural Biological Food Engineers (AOCABFE)

Professional Activities

Active

2019 -

Contributor to the Pangeo (https://pangeo.io/) project - A community platform for Big Data geoscience
Member of American Federation of Teachers (AFT)

2018 -

Student Member of American Association for Aerosol Research (AAAR)
Student Member of American Meteorological Society (AMS)

2017 -

Student Member of Chinese-American Professors in Environmental Engineering and Science (CAPEES)

2016 -

Student Member of American Geophysical Union (AGU)
Student Member of Association of Environmental Engineering and Science Professors (AEESP)

2015 -

Student Member of Association of Overseas Chinese Agricultural Biological Food Engineers (AOCABFE)

Expired

2016 - 2018

Student Member of Air & Waste Management Association (A&WMA)
Student Member of American Chemical Society (ACS)

2015 - 2016

Student Member of American Society of Agricultural and Biological Engineers (ASABE)

Certificates

Data Science

- Data Scientist in Python, issued by DATAQUEST — 05/2018 -

Machine Learning and Deep Learning (deeplearning.ai)

- Machine Learning by Stanford University on Coursera — 01/2018 -
- Deep Learning Specialization — 06/2018 -
- Neural Networks and Deep Learning — 05/2018 -
- Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization — 05/2018 -
- Structuring Machine Learning Projects — 05/2018 -
- Convolutional Neural Networks — 06/2018 -
- Sequence Models — 06/2018 -

Featured Skills

Data Analysis & Statistics: Python, R, Machine learning, SPSS, Origin
Machine Learning & Deep Learning: TensorFlow
Spatiotemporal Analysis: CyberGIS, ArcGIS
Programming: Bash, MATLAB/GNU Octave, SQL, C, JAVA, OpenMP/MPI/CUDA
Others: ANSYS, SolidWorks, AutoCAD, GAMS, LaTeX, Markdown, MS office

Graduate Coursework

Science

ATMS 420, **Atmospheric Chemistry** A+
ATMS 504, **Physical Meteorology** Audit

Data Analytics and Technology

STAT 542 / CSE 542, **Statistical Learning** A+
STAT 420, **Methods of Applied Statistics** A+
STAT 530, **Bioinformatics** Audit
GEOG 480, **Principles of GIS (Geographic Information System)**
ABE 425, **Engineering Measurement Systems**
CS 420 / CSE 402, **Parallel Programming for Scientists and Engineers**
CS 483 / ECE 408 / CSE 408, **Applied Parallel Programming**

Environmental Engineering

CEE 545, **Aerosol Sampling and Analysis** A+
CEE 546, **Air Quality Control**
CEE 599, **Independent Research (4 Credit Hours, during M.S. studies in ABE)**
CEE 442, **Environmental Engineering Principles, Physical**
CEE 446, **Air Quality Engineering**
CEE 445, **Air Quality Modeling**
CEE 443, **Environmental Engineering Principles, Chemical**

Mathematics

CHBE 521, **Applied Mathematics in Chemical and Biomolecular Engineering**
ME 471 / CSE 451, **Finite Element Analysis**
MATH 442, **Introduction to Partial Differential Equations**