AHMAD MOMENI, PhD

115 Hollister Hall, Cornell University, Ithaca, NY 14853
amomeni@cornell.edu

CURRENT JOB TITLE

Cornell University, Ithaca, NY
Postdoctoral Associate *August 2022 - Present*

School of Civil & Environmental Engineering

Principal Investigator: Professor John D. Albertson (albertson@cornell.edu)
Main Project: Hydrogen Supply Chain Leakage/Fugitive Emissions Estimation
FOAs Collaborated on:

- Department of Energy FOA on Hydrogen Shot (DE-FOA-0002792)
- Department of Energy FOA on Floating Offshore Wind Turbines (DE-FOA-0003003)
- NASA Land Cover Land Use Change Program (ROSES 2024)

RESEARCH OBJECTIVES/INTERESTS

- Designing and Fine-tuning Cyber-infrastructural and AMI Sensors for Data Acquisition and Monitoring

- Integrating Top-down and Bottom-up Leakage Methods By Employing Inverse Modeling & Machine learning

- Incorporating Sophisticated Machine Learning Algorithms and Digital Twins Representations for Real-time Applications of Stochastic Water Pipeline Condition Assessment and Water Quality Modeling

- Conducting Sustainability and Cost Analysis of AMI/Cybermonitoring Self-powered Sensor Networks

- Investigating Human Interventions and Factors in Managing Cyber-infrastructure Data and Resources in Water Pipelines

- Developing State-of-the-art Guidance GUIs for Convenient End-user Interactions with Cyber-infrastructure Platforms

- Building an Interactive GUI for Adaptive, Real-time Monitoring Control of Interdependent Critical Infrastructures (ICIs)

- Devising Interactive System-of-Systems Performance Metrics for Real-time Optimization of ICIs

EDUCATION

PhD in Civil Engineering *2017 - 2022*
Clemson University, Clemson, SC
Minor: Construction Engineering and Management
Advisor: Dr. Kalyan R. Piratla
Dissertation: "Machine learning-enabled model-based condition assessment of water pipelines by leveraging hydraulic monitoring data"

Master of Science in Civil Engineering *2014 - 2017*
Amirkabir University of Technology, Tehran, Iran
Minor: Construction Engineering and Management
Thesis: "Prioritization of Project Delivery Items Using Delphi Method and TOPSIS"

Bachelor of Science in Civil Engineering *2009 - 2014*
Shahid Beheshti University, Tehran, Iran
Minor: Dams and Distribution Networks

GRANT & AWARD COLLABORATION

Department of Energy Funding Opportunity Announcement ($DE-FOA-0002792$) *2023*

"*High Speed, High Sensitivity Laser Analyzer for Measuring Hydrogen Emissions: Development and Validation*"

- Preparing & drafting a Department of Energy (DOE) grant extension proposal on inferring hydrogen fugitive emissions
- Literature review on established knowledge about hydrogen indirect impact on global warming and state-of-the-art hydrogen emissions detection methods

Department of Energy Funding Opportunity Announcement ($DE-FOA-0003003$) *2023*

"*Multi-scale Physics Guided Learning and Control of Floating Wind with Integration to Hydrogen Production and Maritime Operations*"

- Assisting in preparing & drafting a multimillion-dollar Department of Energy (DOE) grant proposal on Floating Offshore Wind Turbines
- Literature Review on established knowledge about Floating and Fixed Wind Turbines and their aerodynamics

RESEARCH EXPERIENCE

Postdoctoral Research, "**Mobile Sensor-based Hydrogen Supply Chain Leakage/Fugitive Emissions Measurement Using Inverse Modeling & Machine Learning**" *2022 - Present*

- Developing an inverse-modeling, sensor-based hydrogen supply chain fugitive emissions predictive platform through collaboration with Environemtal Defense Fund (EDF), Aerodyne Research, and Methane Emissions Technology Evaluation Center (METEC) and National Renewable Energy Laboratory (NREL)
- Conducting mobile sensor-based experiments at METEC at Colorado State University

Dissertation Research, "**Machine learning-enabled model-based condition assessment of water pipelines by leveraging hydraulic monitoring data**" *2017 - 2022*

- Developing a machine-learning-based predictive tool for assessment of pipe roughness, pipe effective hydraulic diameter, and leakage measurement
- Predicting pipe conditions utilizing robust characterization of optimized neural networks and genetic as well as particle swarm algorithms in MATLAB and/or Python programming environments
- Including stochastic analyses of uncertain parameters for the proposed model-based leakage detection and measurement

- Conducting comprehensive sensitivity analyses on model assumptions according to water distribution system benchmarks such as Hanoi and GoYang

SCDOT-funded Research Assistant, "**Evaluating the Construction Cost and Schedule Impacts of SCDOT's Traffic Control Restrictions"** *2021 - 2022*

- Modeling traffic fatalities in South Carolina in correlation to hazardous conditions of roads using machine-learning methods
- Optimizing hyperparameters associated with input-output data from crash database
- Conducting comprehensive Sensitivity Analyses on environmental and road conditions associated with crash pattern in South Carolina

NSF-funded Research Assistant, "**CRISP Type 1: Data-driven Real-time Simulation for Adaptive Control of Interdependent Infrastructure Systems**" *2017 - 2022*

- Developing a transient-steady-transient analysis platform for a benchmark water distribution network using Method of Characteristics and EPANET in MATLAB
- Implementing an interactive power-water interdependency framework to capture dynamics at near-real-time intervals amid cascading failures
- Circumventing time-consuming exchange simulators in the model using ANN-trained networks
- Conducting comprehensive sensitivity analyses on assumed model parameters for transient analysis

NSF-funded Research Assistant, "**EAGER: SSDIM: Multiscale Methods for Generating Infrastructure Networks**" *2017 - 2022*

- Developing a generator-optimizer scheme using graph theory and EPANET simulator to produce representative artificial water distribution networks using infrastructural data
- Fine-tuning mass-generated networks using an ad-hoc function in Python
- Conducting a comprehensive optimization for network parameters to mimic real-world networks
- Generating thousands of representative artificial networks for research community in lieu of scarce real-world networks

PUBLISHED WORKS

Journal Articles

Momeni, A., Dharmawardena, H., Prasad, V., Piratla, K. R., & Venayagamoorthy, K. (2024). "Modeling Near-real-time Multiphase Cascading Failures Across Interdependent Critical Infrastructures". *Journal of Structure and Infrastructure Engineering.* **(Published)**

Momeni, A., Yerri, S., Piratla, K. R. & Madathil K. C. (2022)."Evaluation of Water Supply Reliability Improvement Enabled by Onsite Greywater Reuse Systems". *Journal of Resources, Conservation & Recycling.* **(Published)**

Momeni, A. & Piratla, K. R. (2023). "Stochastic Model-based Leakage Prediction in Water Mains Considering Pipe Condition Uncertainties". *Journal of Tunnelling and Underground Space Technology.* **(Published)**

Momeni, A., & Piratla, K. R. (2021). "A Proof-of-Concept Study for Hydraulic Model-Based Leakage Detection in Water Pipelines Using Pressure Monitoring Data". *Journal of Frontiers in Water, 3.* https://doi.org/10.3389/frwa.2021.648622. **(Published)**

Momeni, A., & Piratla, K. R. (2021). "Leveraging Hydraulic Cyber-Monitoring Data to Support Primitive Condition Assessment of Water Mains". *ASCE Journal of Pipeline Systems Engineering and Practice*, 12(4), 04021054. **(Published)**

Momeni, A., Piratla, K. R., & Madathil K. C. (2022). "Application of Neural Network-based Modeling for Leak Localization in Water Mains". *ASCE Journal of Pipeline Systems Engineering and Practice.* **(Published)**

Momeni, A., Chauhan, V., Bin Mahmoud, A., Piratla, K. R., & Safro. I. (2023). "Generation of synthetic water distribution data using a multiscale generator-optimizer". *ASCE Journal of Pipeline System Engineering and Practice.* **(Published)**

Bin Mahmoud, A., **Momeni, A.** & Piratla, K. R. (2023). "Optimal Near Real-time Control of Water Distribution System Operations". *MDPI Water Journal.* **(Published)**

Momeni, A., Albertson, J. D., Herndon, S., Daube, C., Nelson, D., Roscioli, J., Shorter, J., Lunny, E., Wehr, R., Gadikota, G., & Sun, T., "Quantification of Hydrogen Emission Rates Using Downwind Plume Characterization Techniques". **(Under Review, Environmental Science & Technology Letters).**

Akel, A. J. N., Nazari, N., Hegde, S., Piratla, K., Chalil Madathil, K., **Momeni, A.**, Albert, A., & Fedele, L., "Data-Driven analysis of Transportation Collision Reports: Unveiling patterns and insights for enhanced Accident Prevention Strategies". **(Under Review, Accident Analysis and Prevention).**

Refereed Conference Proceedings

Lunny, E., Wehr, R., Roscioli, J., Daube, C., Herdnon, S., Shorter, J., Sun, T., Long, W., **Momeni, A.**, Herndon, S., and Nelson, D. (2024). "Quantifying leaks with a field-deployable, fast, sensitive hydrogen instrument", *EGU24.*

Herdnon, S., Nelson, D., Daube, C., Sun, T., Lunny, E., Roscioli, J., Shorter, J., Wehr, R., Long, W., **Momeni, A.**, and Albertson, J.D. (2023). "Quantification of controlled hydrogen releases using a novel instrument on a mobile platform", *AGU23.*

Momeni, A., and K. R. Piratla. (2023). "Model-Based Leakage Detection for Large-Scale Water Pipeline Networks", *ASCE UESI Pipelines Conference, Helsinki, Finland, August 10, 2023.*

Momeni, A., and K. R. Piratla. (2022). "Optimal Placement of Pressure Monitoring Sensors for Data-driven Leakage Detection in Water Distribution Pipelines", *38th International No-Dig Conference & Exhibition, Helsinki, Finland, October 3-5, 2022.*

Momeni, A., and K. R. Piratla. (2022). "Machine Learning-Based Pipelines Leakage Prediction Scheme Using Smart Monitoring In Water Distribution Systems", *North American Society for Trenchless Technology (NASTT) No-Dig Show, Minneapolis, Minnesota, April 10-14, 2022.*

Momeni, A., and K. R. Piratla. (2022). "Prediction of Water Pipeline Condition Parameters Using Artificial Neural Networks", *ASCE UESI Pipelines Conference.*

Momeni, A., and K. R. Piratla. (2020). "A novel cyber-monitoring based asset management scheme for water distribution networks through fine-tuning genetic algorithm parameters." 37^{th} Int. *No-Dig Conf. and Exhibition 2019. London: International Society for Trenchless Technology.*

Momeni, A., K. R. Piratla, and K. C. Madathil. (2019). "A novel computationally efficient asset management framework based on monitoring data from water distribution networks." *ASCE Construction Research Congress. Reston, VA: ASCE.*

Momeni, A., and K. R. Piratla. (2019). "A Novel Water Pipeline Asset Management Scheme Using Hydraulic Monitoring Data". *Pipelines 2019: Multidisciplinary Topics, Utility Engineering, and Surveying.*

Momeni, A., Prasad, V., Dharmawardena, H. I., Piratla, K. R., & Venayagamoorthy, K. (2018). "Mapping and Modeling Interdependent Power, Water, and Gas Infrastructures". *Clemson University Power Systems Conference, PSC: IEEE.*

TEACHING AND MENTORING EXPERIENCE

Civil and Environmental Engineering, Cornell University, Ithaca, NY

Instructor - Transport, Mixing, and Transformation in the Environment *Spring 2023 & 2024*

- Introduce Transport Processes
- Introduce Advection-Diffusion Equation
- Introduce Turbulence and Shear Flow Dispersion

Glenn Department of Civil Engineering, Clemson University, Clemson, SC

Research Mentor - Introduction to Machine-Learning-based Leakage Detection *2021*

- Introduce an undergraduate student to water pipeline and leakage detection
- Weekly meeting to instruct for MATLAB-based ANN programming framework
- Provide feedback on the MATLAB code and results every week

Teaching Assistant - Construction Engineering & Management *2019 - present*

- Assist in and facilitated class sessions on Construction Methods, Bidding, Project Finances
- Co-create test questions, as well as homework or class assignments using for 50^{+}-student class
- Proctor and grade exams and communicating students' grades via in-person or virtual meetings

Teaching Assistant - Engineering Economics *2018 - 2020*

- Familiarize students with present/future values and calculation of simple and compound interests
- Proctor and grade exams, and communicate students' grades via in-person or virtual meetings
- Provide in-person feedback on class performance, grades, and attendance

Teaching Assistant - Statics *2017 - 2018*

- Assist students in understanding assignments and quizzes via in-person meetings
- Provide in-person feedback on class performance, grades, and attendance
- Proctor and grade exams, and communicate students' grades via in-person or virtual meetings

Instructor - Underground Construction *2017 - 2019*

- Instruct MATLAB basics to graduate students
- Familiarize graduate students with water pipeline toolkit in MATLAB
- Arrange in-person meetings to help graduate students improve their class projects
- Assist in grading point papers and quizzes

Civil Engineering Department, Amirkabir University of Technology, Tehran, Iran

Teaching Assistant - Construction Engineering & Management *2016 - 2017*

- Provide feedback on students' projects on delivery methods
- Assist students in writing CEM research articles
- Familiarize students with project implementation in MS Project

Zanganeh Training Center, Tehran, Iran

Instructor - TOEFL/IELTS/GRE Courses *2013 - 2017*

- Offer systematic certificate-based advanced courses on TOEFL/IELTS/GRE basics and concepts
- Tutor 100^{+} students on basic to advanced English language topics
- Tutor students on certificate-based English tests such as TOEFL/IELTS/GRE/SAT
- Offer basic to advanced grammar classes
- Offer critical writing and reading courses
- Guide prospective graduate students on university application and immigration necessities
- Offer speaking, writing, reading, and listening interactive courses to various age ranges

RESEARCH AWARDS AND PROFESSIONAL TRAINING

Training, Fellowships, and Awards

Cornell Postdoc Leadership Program *Fall 2022*

- Learning skills of integration and synthesis
- Examining and practicing tools for addressing individual and team conflict
- Building the postdoc community and provide an opportunity to network with others
- Experiencing leadership contexts and organization structures and their impact on individuals, teams, and their work

Writing-In-the-Disciplines Fellowship *Spring 2022*

- Devising disciplinary writing frameworks for critical analysis
- Critical writing analysis in intra-disciplinary research and teaching schemes

Writing-Across-the-Curriculum Fellowship *Fall 2021*

- Learning about novel writing methods of TA'ing and Teaching
- Developing personalized curricula and syllabi

Annual Glenn Research Symposium, 1st-Place Winner *April 2021*

- Presenting a novel leakage-detection framework using ANN and optimization algorithms
- Refereed by ten people from both academic and industrial spectra

Construction Research Congress Certificate of Recognition, Expert Peer-Reviewer *2020*

- Contributing to the success of the ASCE Construction Research Congress 2020
- Peer-reviewing several submitted papers

UESI Conference Poster Presentation, Award Winner *2020*

- Winning Poster Presentation Award for pipeline condition assessment study, titled "Leveraging Pressure-Monitoring Data for Water Pipeline Condition Assessment Using Neural Networks in A Novel Data-driven Asset Management Scheme "

Programming Skills

Python, Professional

- Completing an NSF-funded project in Python on Ubuntu environment
- Accomplishing Python Bootcamp Program Including Basic to Machine-learning Applications

MATLAB, Proficient

- Holding professional MATLAB certificate in coding
- More than 10 years of professional usage of MATLAB environment including three NSF-funded projects in academic settings

Tools & Software

Visualization:

Matplotlib, *PowerBI*, *gnuplot*, *ArcGIS Pro*

Data Handling:

numpy, *pandas*, *scipy*, *MySQL*, *Excel Power Query*

Optimization:

Genetic Algorithm, *NSGAII*, *Particle Swarm Algorithms*, *Platypus*

Machine Learning & Deep Learning:

MATLAB Neural Netowrks, *Keras & TensorFlow (with GPU)*, *PyTorch*, *Scikit-learn*, *DNN*, *ANN & CNN*, *GANs*, *Deep Convolution GANs*, *Controllable & Conditional GANs*

Other:

EPANET 2.2, *Spyder*, *MobaXterm*, *SCADA/Data Query*, *Visio*, *LaTex*, *Office & Access*

Languages

Persian, Native
English, Fluent
French & Spanish, Lower-Intermediate

PROFESSIONAL EXPERIENCE

Engineering Intern, "Cobb County-Marietta Water Authority, Marietta, GA" *Summer 2021*

- Developing an automated stochastic ANN-based prediction tool for water demand in Cobb County, Ga. in MATLAB
- Identification of ten contributing meteorological parameters in water consumption pattern in Cobb County
- Updating existing deterministic demand prediction tools
- Fine-tuning CIP spreadsheets and point papers
- Automating data extraction for MIB and Geosmin data for Quarles treatment plant reservoir
- Automating the QA/QC procedure for diurnal system demand

Engineering Intern, "Tehran Regional Water and Wastewater Authority" *Summer 2012*

- Conducting data collection from 20 freshwater sub-ground pumps
- Updating bidding documents and project delivery spreadsheets

SERVICE AND LEADERSHIP

Reviewer, ASCE Journal of Pipelines Systems Engineering and Practice *2021 - present*

- Distinguished Reviewer in 2021, Featured on the landing page of the journal
- Peer-reviewing several review and original research articles

Reviewer, Taylor & Francis Urban Water Journal *2022 - present*

- Peer-reviewing several review and original research articles

Reviewer, ASCE UESI Conference *2020 - present*

- Peer-reviewing and refereeing several conference papers and poster presentations

Civil Engineering Graduate Student Council Member *2020 - 2022*

- Monthly meeting regarding graduate students' concerns in the department
- Coordinating field days and kickoff parties
- Joint meeting with undergraduate student council to integrate graduate and undergraduate students' academic experience
- Contributing to ASCE/ITE meeting coordination

Outreach Program Group Leader, Fundamentals of Aviation and Drones *2020*

- Tutoring high school students on a field trip on how to operate unmanned aerial vehicles
- Conducting a preliminary study on usage of *RTK* units in unmanned aerial vehicles

President, Clemson Iranian Association Student Organization *2018 - 2019*

- Monthly meeting regarding Iranian students' concerns and challenges
- Leading Persian parties on special occasions such as Nowruz and Yalda Night
- Coordinating kickoff party for Iranian newcomers
- Counseling Iranian students on academic and non-academic matters at Clemson

PROFESSIONAL AFFILIATIONS/MEMBERSHIPS

North American Society For Trenchless Technology, Professional Member *2017 - present*
American Society of Civil Engineers, Professional Member *2017 - 2022*
FAA Part 107 *Unofficial License Holder* *2020*