

Mahmoudreza Momeni (Semko)

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Status: Permanent Resident of the United States

HIGHLIGHTS

- Developer of Python-based Data Assimilation Framework (PyDAF),
- Strong experience in managing, leading, and coordinating teams for project execution,
- Strong experience in inverse/atmospheric modeling, data assimilation, & climate change,
- Strong experiences in machine/deep learning, data science, big data, optimization, remote sensing, & radar,
- Strong experiences in data assimilation (iFDMB, KF, EnKF, 3DVar, 4DVar), Computational Fluid Dynamic (CFD), & biosphere/atmosphere interaction,
- Professional programming with Python, Fortran, cshell and experience with Matlab, R, C++, perl, & Jupyter Notebook,
- Proficient in data visualization and analysis by Python, ArcGIS, & IGOR,
- Excellent experiences in Parallel (MPI, OpenMPI, GPU) & Object-Oriented Programming,
- Excellent proficiency in the use of Unix/Linux-based computer system & cluster,
- Proficient in CMAQ/CMAQ-DDM/CMAQ-Adjoint, CESM-CLM, WRF/WRFChem, GEOSChem-Adjoint, & SMOKE Models,
- Qualified experience in technical negotiation and conversation and scientific writing skills,
- Ability to work under pressure and multitask to meet deadlines by consideration of cost, safety, environment, and company's mission and vision,
- Outstanding team performer as well as dedication to work independently.

EDUCATIONs

2020-2024 Ph.D., Atmospheric Science, University of Houston (UH), Houston, TX.

2018-2020 Researcher, Drexel University, Philadelphia, PA.

2016-2018 M.Sc., Environmental Engineering, Washington State University (WSU), Pullman, WA.

2008-2011 M.Sc., Civil-Environmental Engineering, University of Tehran (UT), Tehran, Iran.

2002-2007 B.Sc., Civil Engineering, Isfahan University of Technology (IUT), Isfahan, Iran.

AWARDS

2024 *Outstanding Graduate Work in Atmospheric Sciences Award*, UH.

2023 *Outstanding Academic Achievement Award for Ph.D. Work in Atmospheric Sciences Award*, UH.

2022 *Earth and Atmospheric Sciences Outstanding Graduate Student Award*, UH.

2022 *AGU GeoHealth Elevator Pitch Competition*, qualified for final Stage.

2021 *The 2021 Oral Presentation-M.S. and First Year PhD Student Award for developing a python-based 4DVar-AI data assimilation framework*, UH.

RESEARCH GRANTS

2023 *Assessing the Impact of Revised NH_3 Emissions on Spring and Summer $PM_{2.5}$ Levels in Texas*, Texas Air Research Center (TARC).

2022 *Refining ammonia emissions using inverse modeling and satellite observations over Texas and the Gulf of Mexico and investigating its effect on fine particulate matter*, Texas Air Quality Research Program (AQRP).

CERTIFICATES

- 2024 *The badges of Parallel Computing with MPI and GPGPU Programming*, Hewlett Packard Enterprise Data Science Institute, UH.
- 2024 *Wilderness and Remote First Aid*, BSA-SAM Houston Area Boy Scouts.
- 2023 *Satellite Data for Air Quality Environmental Justice and Equity Applications*, NASA's Applied Remote Sensing Training Program (ARSET), NASA.
- 2023 *Fundamentals of Machine Learning for Earth Science*, NASA's Applied Remote Sensing Training Program (ARSET), NASA.
- 2019 *Oil and GAS*, EPA.
- 2019 *Speciate's VOC and PM Speciation Profiles and their Use to Prepare for Air Quality Modeling*, EPA
- 2018 *Satellite Remote Sensing of Dust, Fires, Smoke, and, Air Quality*, NASA's Applied Remote Sensing Training Program (ARSET), NASA.

EXPERIENCES

- 2020-Now Atmospheric/Inverse Modeling, Data Assimilation/Scientist, Climate Change, Machine/Deep Learning, Advanced Sensitivity Analysis (Adjoint, DDM)
UH weather, air quality, artificial intelligence group, UH, Houston, TX
- Development of a Python-based Data Assimilation Framework (PyDAF), supporting models (CMAQ, WRFChem, GEOSChem), methods (4DVAR, 3DVAR, iMB, iFDMB, KF, EnKF), satellites (CrIS, IASI, TROPOMI), & radar (Nexrad).
 - Investigated the impact of climate change adaptation strategies (vehicle electrification) on air quality across four major U.S. cities.
 - Studying aerosol-cloud interactions to assess their impacts on climate.
 - Developed a deep learning based emulator for simulating CMAQ surface NO₂ levels over the CONUS.
 - Constrained East Asia ammonia (NH₃) emissions through PyDAF.
 - Employing PyDAF to revise global methane (CH₄) emissions.
 - Developed a Reduced Complexity Model (RCM) of CMAQ-Adjoint for CO₂.
 - Developed a new Fortran-based Lagrangian diagnostic tools.
 - Developed observational operator & its adjoint for CrIS, IASI, TROPOMI, & Nexrad.
 - Determined the source contributions of surface ozone in the Seoul Metropolitan Area Using the Adjoint of CMAQ.
 - Refining NH₃ emissions estimates over Texas and the Gulf of Mexico using PyDAF, and assessing their effect on fine particulate matter (PM_{2.5}).
 - Innovative approaches for accurate O₃ prediction and health risk analysis in South Korea: The combined effectiveness of deep learning and AirQ+.
 - Applied inverse modeling technique to investigate the change of O₃ regime over U.S. through OMI NO₂ and HCHO product.
 - Presenting weekly/monthly report at group or board members meetings.
 - ~> **Project Involvement:** Actively contributing to projects funded by prestigious organizations, including NASA, Department of Energy (DOE), AQRP, & TARC.
 - ~> **Project Leadership:** Successfully led three major projects funded by AQRP & TARC, and currently leading a significant project funded by DOE.
- 2018-2020 Atmospheric Modeling/Chemistry, Advanced Sensitivity Analysis, Data Scientist
Drexel University, Philadelphia, PA
- Employed data assimilation using satellite NH₃ observations.
 - Developed a Reduced Complexity Model (RCM) of CMAQ-Adjoint for NH₃.

- 2018-2020
- Developed the primary PM module of CMAQ-Adjoint model and made CMAQ-Adjoint model user-friendly
 - Implemented a four-dimensional variational data assimilation (4D-Var) method.
 - Developed the adjoint of NH₃ retrieval for CrIS and Analyzed CrIS satellite data.
 - Investigated the impacts of climate change mitigation efforts on premature mortality from Black Carbon and Organic Carbon exposure in Philadelphia.
 - Presented weekly/monthly report in group or board members meetings.
- ~> **Project Involvement:** Actively contributed to a projects funded by NASA.
- 2016-2018 Air Quality and Climate Modeling, Data Scientist, Programming
Laboratory for Atmospheric Research (LAR), WSU, Pullman, WA
- Successfully Operated the Community Land Model (CLM) on a cluster for advanced biosphere/atmosphere interaction modeling.
 - Conducted research on atmospheric chemistry/physics and oxidation processes.
 - Estimated sensible/latent heat and BVOCs fluxes across the western U.S.
 - Conducted research on source apportionment (CMB), visibility (IMPROVE), and aerosol dynamic & chemistry.
 - Developed advanced Python scripts for the geospatial visualization (big data).
 - Presented weekly/monthly report in group or board members meetings.
- ~> **Project Involvement:** Actively contributed to a project funded by EPA.
- 2011-2016 Air Quality Modeling/Management, CFD, Programmer, Data Scientist
Vehicle, Fuel, & Environment Research Institute (VFERI), Tehran, Iran
- Developed a Open Source Solver CFD and Lattice Boltzmann (LBM) supporting GPU and MPI.
 - Developed a Fortran-Python framework for conducting statistical analyses and visualizing geospatial data from CMAQ outputs.
 - Utilized ArcGIS for in-depth statistical and geospatial analysis.
 - Implemented a modeling framework to forecast air pollution levels in Tehran, integrating SMOKE, CMAQ, and WRF models.
 - Estimated external costs due to the air pollution in Tehran city.
 - Formulated a comprehensive plan aimed at mitigating air pollution in Tehran.
 - Contributed to multiple projects focused on air quality assessment/managment.
 - Executed an extensive evaluation of Tehran City's State of Environment (SoE).
 - Developed a strategic roadmap for hybrid vehicles adoption within Iran, including an assessment of their integration into Tehran's public transportation system.
 - Presented weekly/monthly report in managerial or board members meetings.
- ~> **Project Involvement:** Actively contributed to multiple projects funded by prestigious organizations
- ~> **Project Leadership:** Successfully led three significant projects.
- 2011-2008 Air Quality Modeling/Management, Programming
Numerical Laboratory for Air Quality Modeling, UT, Tehran, Iran
- Developing a mathematical model to predict particle motion in the different atmospheric stability classification.
 - Contributed to multiple projects focused on air quality modeling/managment.
 - Employed ArcGIS for detailed geospatial analysis and for visualization.
- ~> **Project Involvement:** Actively contributed to multiple projects.

PUBLICATIONS and REFERENCES

The results of my research have submitted and published in several conferences and journal papers so far. References are available on request.