Masoud Ghahremanloo

Remote sensing scientist & AI model developer
I am a PhD holder and Postdoc Scholar at University of Houston, with extensive experience in atmospheric sciences, satellite remote sensing, and artificial intelligence (AI).

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Education

- University of Houston, Houston, USA. 2019-2023. PhD in Atmospheric Sciences and Meteorology (GPA: 4/4).
  Thesis title: Machine Learning Estimation of Daily Surface Concentrations of $PM_{2.5}$, NO_2, and MDA8 Ozone at High Spatiotemporal Resolutions.
  Supervisor: Dr. Yunsoo Choi.

- K. N. Toosi University of Technology (KNTU), Tehran, Iran. 2015-2018. M.Sc. in Geomatics Engineering - Remote Sensing. KNTU ranks 1st amongst Iranian universities in the field of Remote Sensing Engineering.
  Thesis title: Enhancement of the accuracy of TSMI model in soil moisture estimation using surface radiometric temperature, Landsat satellite images, and SMEX04 field data.
  Supervisor: Prof. Mohammad Reza Mobasheri.

- University of Zanjan, Zanjan, Iran. 2008-2012. B.Sc. in Civil Engineering-Surveying.

Publications

Journal Papers: [Total Number of Citations: 1017]

- Salman, A. K., Choi, Y., Park, J., Mousavinezhad, S., Payami, M., Momeni, M., & **Ghahremanloo, M.** (2023). Deep learning based emulator for simulating CMAQ surface NO2 levels over the CONUS. Atmospheric Environment, 120192.

- Mousavinezhad, S., Choi, Y., Khorshidian, N., **Ghahremanloo, M.,** & Momeni, M. (2024). Air quality and health co-benefits of vehicle electrification and emission controls in the most populated United States urban hubs: Insights from New York, Los Angeles, Chicago, and Houston. Science of The Total Environment, 912, 169577.

- Nelson, D., Choi, Y., Sadeghi, B., Yeganeh, A. K., **Ghahremanloo, M.,** & Park, J. (2023). A comprehensive approach combining positive matrix factorization modeling, meteorology, and machine learning for source apportionment of surface ozone precursors: Underlying factors contributing to ozone formation in Houston, Texas. Environmental Pollution, 122223.

- Borhani, F., Shafiepour Motlagh, M., Ehsani, A. H., Rashidi, Y., **Ghahremanloo, M.**, Amani, M., & Moghimi, A. (2023). Current Status and Future Forecast of Short-lived Climate-Forced Ozone in Tehran, Iran, derived from Ground-Based and Satellite Observations. *Water, Air, & Soil Pollution*, 234(2), 134.

- Singh, D., Choi, Y., Dimri, R., **Ghahremanloo, M.,** & Pouyaei, A. (2023). An Intercomparison of Deep-Learning Methods for Super-Resolution Bias-Correction (SRBC) of Indian Summer Monsoon Rainfall (ISMR) Using CORDEX-SA Simulations. Asia-Pacific Journal of Atmospheric Sciences, 1-14.

- Mousavinezhad, S., **Ghahremanloo, M.,** Choi, Y., Pouyaei, A., Khorshidian, N., & Sadeghi, B. (2023). Surface ozone trends and related mortality across the climate regions of the contiguous United States during the most recent climate period, 1991–2020. *Atmospheric Environment*, 119693.

- **Ghahremanloo, M.**, Choi, Y., & Lops, Y. (2023). Deep learning mapping of surface MDA8 ozone: The impact of predictor variables on ozone levels over the contiguous United States. Environmental Pollution, 121508.

- **Ghahremanloo, M.**, Lops, Y., Choi, Y., Mousavinezhad, S., & Jung, J. (2023). A Coupled Deep Learning Model for Estimating Surface NO2 Levels from Remote Sensing Data: 15-Year Study over the Contiguous United States. Journal of Geophysical Research: Atmospheres, 128(2), e2022JD037010.

- Sadeghi, B., **Ghahremanloo, M.**, Mousavinezhad, S., Lops, Y., Pouyaei, A., & Choi, Y. (2022). Contributions of meteorology to ozone variations: Application of deep learning and the Kolmogorov-Zurbenko filter. *Environmental Pollution*, 310, 119863.

- Lops, Y., **Ghahremanloo, M.**, Pouyaei, A., Choi, Y., Jung, J., Mousavinezhad, S., ... & Hammond, D. (2022). Spatiotemporal Estimation of TROPOMI NO_2 Column with Depthwise Partial Convolutional Neural Network. *arXiv preprint arXiv:2204.05917*.

- Jung, J., Choi, Y., Mousavinezhad, S., Kang, D., Park, J., Pouyaei, A., **Ghahremanloo, M.**, ... & Kim, H. (2022). Changes in the ozone chemical regime over the contiguous United States inferred by the inversion of NOx and VOC emissions using satellite observation. *Atmospheric Research*, 270, 106076.

- **Ghahremanloo, M.**, Lops, Y., Choi, Y., Jung, J., Mousavinezhad, S., & Hammond, D. (2022). A comprehensive study of the COVID-19 impact on $PM_{2.5}$ levels over the contiguous United States: A deep learning approach. *Atmospheric Environment*, 118944.

- **Ghahremanloo, M.**, Lops, Y., Choi, Y., & Yeganeh, B. (2021). Deep Learning Estimation of Daily Ground-Level NO_2 Concentrations from Remote Sensing Data. *Journal of Geophysical Research: Atmospheres*, 126(21), e2021JD034925.

- Mousavinezhad, S., Choi, Y., Pouyaei, A., **Ghahremanloo, M.**, & Nelson, D. L. (2021). A comprehensive investigation of surface ozone pollution in China, 2015–2019: Separating the contributions from meteorology and precursor emissions. *Atmospheric Research*, 257, 105599. https://doi.org/10.1016/j.atmosres.2021.105599.

- **Ghahremanloo, M.**, Choi, Y., Sayeed, A., Salman, A. K., Pan, S., & Amani, M. (2021). Estimating daily high-resolution $PM_{2.5}$ concentrations over Texas: Machine Learning approach. *Atmospheric Environment*, 247, 118209. https://doi.org/10.1016/j.atmosenv.2021.118209.

- **Ghahremanloo, M.**, Lops, Y., Choi, Y., & Mousavinezhad, S. (2021). Impact of the COVID-19 outbreak on air pollution levels in East Asia. *Science of The Total Environment*, 754, 142226. https://doi.org/10.1016/j.scitotenv.2020.142226.

- Amani, M., Ghorbanian, A., Ahmadi, S. A., Kakooei, M., Moghimi, A., Mirmazloumi, S. M., ... & Brisco, B. (2020). Google earth engine cloud computing platform for remote sensing big data applications: A comprehensive review. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*. 13. 5326 – 5350. doi: 10.1109/JSTARS.2020.3021052.

- **Ghahremanloo, M.**, Mobasheri, M. R., & Amani, M. (2019). Soil moisture estimation using land surface temperature and soil temperature at 5 cm depth. *International Journal of Remote Sensing*, *40*(1), 104-117. https://doi.org/10.1080/01431161.2018.1501167.

Conference Papers & Presentations:

- **Ghahremanloo, M.**, Choi, Y., Lops, Y., (2023). Deep learning mapping of surface MDA8 ozone: The impact of predictor variables on ozone levels in U.S. *AGU Fall Meeting*. [Poster].

- **Ghahremanloo, M.**, Lops, Y., Choi, Y., Mousavinezhad, S., & Jung, J. (2022). A Coupled Deep Learning Model for Estimating Surface NO_2 Levels from Remote Sensing Data: 15-Year Study over the Contiguous United States. *AGU Fall Meeting*. [Poster].
- Sadeghi, B., **Ghahremanloo, M.**, Mousavinezhad, S., Lops, Y., Pouyaei, A., & Choi, Y., (2022). Contributions of Meteorology to Ozone Variations: Application of Deep Learning and the Kolmogorov-Zurbenko Filter. *AGU Fall Meeting*. [Poster].
- Mousavinezhad, S., **Ghahremanloo, M.**, Choi, Y., Pouyaei, A., & Sadeghi, B. (2022). Ground Level Ozone Trends Across the Climate Regions of the Contiguous United States During the Most Recent Climate Period, 1991-2020. *AGU Fall Meeting*. [Poster].
- Jung, J., Choi, Y., **Ghahremanloo, M.**, Lops, Y., Momeni, M., & Feng, S. (2022). Estimating NO_x Emissions with Numerical Modeling and Deep Learning Estimated Complete Surface NO_2 Map. *AGU Fall Meeting*. [Poster].
- **Ghahremanloo, M.**, Lops, Y., Choi, Y., Yeganeh, B. (2021). Deep Learning Estimation of Daily Ground-Level NO_2 Concentrations from Remote Sensing Data. *TEMPO Science Team Meeting*. [Poster].
- **Ghahremanloo, M.**, Choi, Y., Sayeed, A., Salman, A. K., Pan, S., & Amani, M. (2020). Estimating $PM_{2.5}$ using remote sensing AOD and AI. *TEMPO Science Team Meeting*. [Poster].
- Mobasheri, M. R., **Ghahremanloo, M.** (2017). 5 cm soil temperature estimation using Landsat images and weather synoptic station data. *ISPRS International Joint Conference*. [Poster].

Research Experiences

- **Postdoctoral scholar** at the UH AQF and Machine Learning group, University of Houston, Houston, USA

  Projects:
  1 - Estimating Surface $PM_{2.5}$ from Satellite Aerosols (Funded by Texas Commission on Environmental Quality (TCEQ), PGA Number: 582-23-41321-025)

- **Research Assistant (2019-2023)** at the UH AQF and Machine Learning group, University of Houston, Houston, USA [1]

  Projects:
  1 - Inverse Modeling of the US NO_2, Formaldehyde, and Ozone (Funded by the NASA Aura Science Team grant, Solicitation: NNH19ZDA001N-AURAST).
  Deriving the sensitivity of ozone to its primary sources using the high order direct decoupled method (HDDM) coupled with the CMAQ model and artificial intelligence (AI)-based HDDM and using this sensitivity for inverse modeling.

  2 - Using Artificial Intelligence and Remote Sensing to Study the Influence of Geographic, Racial, and Socioeconomic Factors on Air Pollutant Exposure and Health Risk Disparities Prior to and during COVID-19 (Funded by the Oak Ridge Associated Universities Foundation (ORAU), Directed Research and Development Program).

  3 - Estimating Surface $PM_{2.5}$ from Satellite Aerosols (Funded by the Texas Commission on Environmental Quality (TCEQ), Grant Number: 582-18-81339).

Honors and Awards

- Award of academic excellence 2021 – EAS Department, University of Houston
- My proposal/research during Ph.D. secured a $75k grant for our research laboratory from the Oak Ridge Associated Universities Foundation (ORAU), Directed Research and Development Program, in March 2021.
- My proposal/research during Ph.D. secured a $50k grant for our research laboratory from the Texas Commission on Environmental Quality (TCEQ), in 2023.
- Interview with UH Media Relations in regard to my research (Link).
- Interview with the college of NSM Media in regard to my research (Link).
- Achieved the highest grades (GPA: 4/4) in all courses during the Ph.D. degree at the University of Houston.
- Ranked 64th in the nationwide (Iran) M.Sc. entrance examination in Geomatics Eng., 2013.

Research Interest

- Satellite Remote Sensing.
- Atmospheric Chemistry, Pollutants, and Aerosols.
- Artificial Intelligence, Machine Learning, and Deep Learning Models.
- Earth and Planetary Sciences.

Work Experience

- Postdoc Scholar at the University of Houston, TX. Oct. 2023 to present. Employer: Dr. Yunsoo Choi.
- Research staff at the University of Houston, TX. May-Sep. 2023. Employer: Dr. Yunsoo Choi.
- Research assistant at the University of Houston, TX. 2019-2023. Supervisor: Dr. Yunsoo Choi.
- Project manager of an engineering project focusing on the positioning of the parking lots' sensors network located in Zanjan city, Iran, using dual-frequency GPS. 2016-2017, Employer: Eng. Mahan Ghahremanloo.
- Deputy manager of the construction site of a 3-million Liter water reservoir in Taleghan city, Iran. 2015-2016. Employer: Dr. Abolfazl Ahmadian, CEO of the Nano Scale Company, which performs projects in the field of Remote Sensing, GIS, Surveying engineering, etc.
- Developing the planimetric map of Zanjan city and many other cities and villages in Iran. 2009 - 2013, Employer: Eng. Hamid Norouzi, CEO of the Bardasht Negar Asia Company, which performs projects in the field of Remote Sensing, GIS, Surveying engineering, etc.
- Linear leveling of the local surveying benchmarks (determining the height of benchmarks from sea level) of 700 Acres of Zanjan province, Iran, using international benchmarks. 2008. Employer: Eng. Hamid Norouzi. Iran National Cartographic Center approved the high accuracy of this project.
- Creating the topographic map of 350 Acres of the suburb of Zanjan city, Iran. 2008-2009, Employer: Eng. Hamid Norouzi. Iran National Cartographic Center approved the high accuracy of this project.

Skills

- **Technical Skills**

- **Satellite Remote Sensing:** Leveraged various satellite instruments to study many different variables related to the Earth and atmosphere, including aerosols, pollutants, soil moisture, surface temperature, vegetation cover, etc.
- **Artificial Intelligence Modelling:** Developed various models to estimate high-resolution surface concentrations of pollutants in the United States. Worked with several AI models: Partial Convolutional Neural Network, Deep Convolutional Neural Network (Deep-CNN), Deep Neural Network (DNN), Random Forest, Multi-layer Perceptron Neural Network (MLP), Support Vector Machines (SVM), K-Nearest Neighbors (KNN), Maximum Likelihood, Adaptive Neuro-fuzzy Inference System (ANFIS), Fuzzy Logic, Multiple Linear Regression, etc.
- **Data Science:** Applied MATLAB/Python programming languages to analyze many different datasets, such as meteorological factors, atmospheric variables, satellite images, etc.
- **Optimization Techniques:** Worked with various optimization approaches, such as Optuna, Genetic Algorithm (GA), Principal Component Analysis (PCA), etc.
- **Atmospheric Modelling:** Familiar with several weather/pollutant forecasting models, such as WRF, SMOKE, and CMAQ.

- **Software Skills**
  - **Programming Languages:** MATLAB and Python.
  - **Remote Sensing Software:** ENVI, ArcGIS.
  - **Engineering Software:** AutoCAD, AutoCAD Civil 3D.
  - **Operating Systems:** Windows (XP/Vista/Seven/Ten) and Linux.
  - **Other Software:** MS Office, Adobe Photoshop.

- **Language Skills**
  - Persian, English, Turkish, familiar with Arabic.

References

Available upon request.