Mozhou (Mo) Gao

gmzsimplelife@gmail.com

CV

WORK EXPERIENCE

Consultant (self-employed**)** May 2025 - Oct 2025

Kuruktag Emissions Consulting Ltd.

- Developed emissions monitoring plans for oil and gas companies.
- Developed grid-based regional methane intensity calculator.

Technical product manager May 2024 - May 2025

Emissions data scientist Oct 2022 - May 2024

SensorUp Inc.

- Collaborated across engineering, data science, and customer success teams to deliver an emissions reconciliation product.
- Participated in data model development, data dictionary creation, data ingress workflow design, and code implementation.
- Developed an emissions reconciliation algorithm and carbon credit calculation engine.

Postdoctoral Researcher (part-time) May 2024 - Dec. 2024

GeoSensorWeb lab, University of Calgary

- Co-developed an emissions event data model following ISO/OGC standards.
- Designed and developed an emissions calculation workflow aligned with Veritas 2.0, OGMP 2.0, and related frameworks.

Research Assistant (part-time) 2019 - 2022

Centre for Smart Emissions Sensing Technologies, University of Calgary

- PoMOLO GHGs emissions sensing truck system
  - Co-developed PoMELO, a commercialized mobile greenhouse gas detection system, incorporating multiple machine learning techniques to locate emission sources and quantify emissions.
- DRIP emissions sensing navigation algorithm
  - Developed an algorithm that optimizes the survey route for mobile emissions detection.
- TROPOMI Satellite emissions screening toolkit
  - Developed a toolkit that automatically detect global emission hotspots using open-source satellite observations.
- LDAR-Sim
  - Core developer of LDAR-Sim, an agent-based simulator designed to help oil and gas companies find optimal leak detection plans.

EDUCATION

Ph.D.
2018 - 2023

Center for Smart Emissions Sensing Technologies, Department of Geography, University of Calgary

Master in Geographic Information Systems
2016 - 2018

Department of Geography, University of Calgary

Bachelor of Science, Specialization in Geophysics
2011 - 2016

Department of Physics, University of Alberta

Skills

- **Programming:** Proficient in Python, R, MATLAB; Proficient in popular data science Python packages such as NumPy, SciPy, Pandas, Scikit-Learn, TensorFlow, PyTorch, etc; Proficient in ArcGIS, and QGIS.
- **Data, Math & Stats:** Strong quantitative analysis skills, particularly in time-series analysis; experienced with a broad range of machine learning and deep learning techniques.
- **Product Development:** Skilled in designing prototype UI/UX demos using Figma and Canva; experienced with Jira. Familiar with creating roadmap, running sprint planning, backlog grooming, and standups. Experienced in writing user stories and running user acceptance test. Familiar with mock workflow using cursor.
- **Domain Expertise:** Methane emissions monitoring, GIS and geospatial modeling, remote sensing image processing, and familiar with various scales of gas sensing systems: vehicle-based, piloted aircraft, drone, handhold, continuous monitoring sensor, optical gas imagery camera, and satellite.

Awards and Scholarship

- Esri Canada GIS Scholarship (May 2019)
- Methane Emissions Reduction Forum PTAC's Student-led innovation poster competition – First Place (Nov 2019)
- Methane Emissions Reduction Forum PTAC's Student-led innovation poster competition – Third Place (Nov 2018)

Publications

[10] **Gao, M.**, & Xing, Z. (2025). Estimating Methane Emissions by Integrating Satellite Regional Emissions Mapping and Point-Source Observations: Case Study in the Permian Basin. *Remote Sensing*, *17*(18), 3143. https://doi.org/10.3390/rs17183143

[9] Xing, Z., Barchyn, T. E., Vollrath, C., **Gao, M**., & Hugenholtz, C. (2024). Satellite-Derived Estimate of City-Level Methane Emissions from Calgary, Alberta, Canada. *Remote Sensing*, *16*(7), 1149. https://doi.org/10.3390/rs16071149

[8] Barchyn, T. E., Hugenholtz, C. H., Gough, T., Vollrath, C., & **Gao, M**. (2023). Low-cost fixed sensor deployments for leak detection in North American upstream oil and gas: Operational analysis and discussion of a prototypical program. *Elementa: Science of the Anthropocene*, *11*(1). https://doi.org/10.1525/elementa.2023.00045

[7] **Gao, M**., Hugenholtz, C. H., Staples, M., Barchyn, T. E., Gough, T. R., Vollrath, C., & Xing, Z. (2023). A cooperative model to lower cost and increase the efficiency of methane leak inspections at oil and gas sites. *Elementa: Science of the Anthropocene*, *11*(1). https://doi.org/10.1525/elementa.2023.00030

[6] **Gao, M**., Xing, Z., Vollrath, C., Hugenholtz, C. H., & Barchyn, T. E. (2023). Global observational coverage of oil and gas methane sources with TROPOMI. *Nature Scientific Reports* 13, 16759. https://doi.org/10.1038/s41598-023-41914-8

[5] **Gao, M**., Hugenholtz, C. H., & Barchyn, T. (2022). Development and validation of a route planning methodology for vehicle-based remote measurements of methane and other emissions from oil and gas wells and facilities. *Journal of the Air & Waste Management Association*. http://doi.org/10.1080/109622 47.2022.2113182

[4] Staples, M., Hugenholtz, C., Serrano-Ramirez, A., Barchyn, T. E., & **Gao, M**. (2023). A Comparison of Multiple Odor Source Localization Algorithms. *Sensors*, *23*(10), 4799. https://doi.org/10.3390/s23104799

[3] **Gao, M**., Hugenholtz, C. H., Fox, T. A., Kucharczyk, M., Barchyn, T. E., & Nesbit, P. R. (2021). Weather constraints on global drone flyability. *Nature Scientific Reports*, *11*(1), 12092. https://doi.org/10.1038/s41598-021-91325-w

[2] Fox, T. A., **Gao, M**., Barchyn, T. E., Jamin, Y. L., & Hugenholtz, C. H. (2021). An agent-based model for estimating emissions reduction equivalence among leak detection and repair programs. *Journal of Cleaner Production*, *282*, 125237. https://doi.org/10.1016/j.jclepro.2020.125237

[1] Fox, T. A., Hugenholtz, C. H., Barchyn, T. E., Gough, T. R., **Gao, M**., & Staples, M. (2021). Can new mobile technologies enable fugitive methane reductions from the oil and gas industry? *Environmental Research Letters*, *16*(6), 064077. https://doi.org/10.1088/1748-9326/ac0565

Conferences:

- AOGS2025
- American Geophysical Union (AGU) Fall Meeting (2024)
- CanCH4 Symposium (2024)
- European Geoscience Union (EGU) General Assembly (2023)
- American Geophysical Union (AGU) Fall Meeting (2023)
- Canada Net Zero Conference and Expo (2022)
- Methane Emissions Reduction Forum (2020)
- American Geophysical Union (AGU) Fall Meeting (2019)
- Methane Emissions Reduction Forum (2019)
- Calgary ESRI Canada User Conference (2019)
- Methane Emissions Reduction Forum (2018)

Conference presentations:

1. **Gao, M.** (2025). An Event-based Methodology to Assimilate Emission Measurement, Estimate Emissions with Associated Uncertainties, and Create Measurement-informed Inventory. AOGS2025.
2. Ashena, Z. B., **Gao, M.,** Kiaei, S., Honarparvar, S., & Liang, S. (2024). Leveraging Retrieval Augmented Generation (RAG) for streamlined methane emission regulatory compliance. AGU24.
3. Kiaei, S., Ashena, Z. B., **Gao, M.,** Honarparvar, S., & Liang, S. (2024). Introducing a crowdsourcing solution using a wearable low-cost sensor to enable more effective emission monitoring in the oil and gas industry. AGU24.
4. **Gao, M**., & Liang, S. (2024). Toward developing a streamlined workflow for methane emission measurement, reporting, and verification in the oil and gas industry. CanCH4 Symposium – Methane by the Numbers, May 13-15.

5. **Gao, M**., & Liang, S. (2024). Toward developing a streamlined workflow for methane emission monitoring, reporting, and verification in the oil and gas industry. EGU General Assembly 2024, Vienna, Austria, 14–19 April 2024. https://doi.org/10.5194/egusphere-egu24-7156
6. Liang, S., **Gao, M.,** & Kiaei, S. (2023). An ISO/OGC-standard-based integrated sensor web architecture for multi-scale methane emissions reconciliation. AGU23.
7. **Gao, M**., Xing, Z., Vollrath, C., Hugenholtz, C. H., Barchyn, T., Gough, T., Billinghurst, C., Wearmouth, C., Staples, M., & Clements, M. (2022). How reliable are satellites for monitoring methane emissions from the oil and gas sector? Net Zero & Methane Emissions Reduction Conference, October 25–27.
8. Fox, T. A., Barchyn, T. E., Gough, T., **Gao, M**., & Staples, M. (2020). Do mobile screening technologies offer cost-effective methane leak detection? [GC085-0007]. American Geophysical Union Fall Meeting, December 1–17.
9. **Gao, M**., Hugenholtz, C. H., Barchyn, T. E., Fox, T. A., & Gough, T. (2020). Optimizing vehicle-based emissions screening with a novel geospatial method. Petroleum Technology Alliance of Canada Methane Emissions Reduction Forum (online poster), November 4–5.
10. Hugenholtz, C. H., Barchyn, T. E., **Gao, M**., Fox, T. A., Staples, M., Gough, T., & Vollrath, C. (2020). Research perspectives on data-driven technology development for emissions monitoring and management. Petroleum Technology Alliance of Canada Methane Emissions Reduction Forum (online talk), November 4–5.
11. **Gao, M**., Hugenholtz, C. H., Fox, T. A., & Barchyn, T. (2019). A geospatial method to assess site suitability for static vehicle-based measurements of methane plumes. [GC51M-0975]. American Geophysical Union Fall Meeting, December 9–13.
12. Barchyn, T., Hugenholtz, C. H., Boulding, A., Fox, T. A., **Gao, M**., Gough, T., Staples, M., & Tarnowsky, B. (2019). Methane plume characterization from rapid single-pass drive-by measurements. [GC51M-0974]. American Geophysical Union Fall Meeting, December 9–13.
13. Fox, T. A., **Gao, M.,** Barchyn, T., & Hugenholtz, C. H. (2019). The LDAR Simulator: An agent-based numerical model for comparing leak detection and repair programs. [GC51M-0959]. American Geophysical Union Fall Meeting, December 9–13.
14. **Gao, M.,** Hugenholtz, C. H., Staples, M., Fox, T. A., Barchyn, T., & Gough, T. (2019). Collaborative LDAR improves efficiency and reduces cost. Petroleum Technology Alliance of Canada Methane Emissions Reduction Forum, November 26–27.
15. Fox, T. A., Hugenholtz, C. H., Gough, T., Barchyn, T., Gao, M., & Staples, M. (2019). Screening LDAR is more expensive than OGI in Alberta. Petroleum Technology Alliance of Canada Methane Emissions Reduction Forum, November 26–27.
16. **Gao, M.,** Fox, T. A., Barchyn, T., & Hugenholtz, C. H. (2018). Drone-based methane sensing: Operational reliability moderated by weather. Petroleum Technology Alliance of Canada Methane Emissions Reduction Forum, November 21–22.

Non-peer-reviewed publications:

1. **Gao, M.** (2023). Replication data for: A cooperative model to lower cost and increase the efficiency of methane leak inspections at oil and gas sites. *Harvard Dataverse.* https://doi.org/10.7910/DVN/CMCM8P
2. **Gao, M.** (2022). A demonstration of route planning methodology for vehicle-based measurements of methane and other gas emissions from point sources. *Figshare*. https://doi.org/10.6084/m9.figshare.17131469.v4

3. Hugenholtz, C. H., Ojagh, S., Barchyn, T. E., **Gao, M**., Vollrath, C., Gough, T., Shaw, K., & Fox, T. A. (2022). Intelligent Methane Monitoring and Management System (IM3S) Project: Final report. Report to the Petroleum Technology Alliance of Canada, 18p.
4. Vollrath, C., Hugenholtz, C. H., **Gao, M.**, Gough, T., & Barchyn, T. E. (2022). Comment on the US EPA proposed new source performance standards: Emissions guidelines to reduce methane and other harmful pollution from the oil and natural gas industry (Docket ID No. EPA-HQ-OAR-2021-0317). https://www.regulations.gov/comment/EPA-HQ-OAR-2021-0317-0747
5. Ojagh, S., Hugenholtz, C. H., Fox, T. A., Vollrath, C., Noseworthy, M., **Gao, M.,** Gough, T., & Barchyn, T. E. (2021). LDAR Sim Draft Web Application Design. Report to the Petroleum Technology Alliance of Canada, 44p.
6. Fox, T. A., Hugenholtz, C. H., Vollrath, C., Noseworthy, M., **Gao, M.,** Gough, T., & Barchyn, T. E. (2021). LDAR Sim Data Input Standards and Protocols. Report to the Petroleum Technology Alliance of Canada, 31p.
7. Ravikumar, A., Hugenholtz, C. H., **Gao, M**., Barlow, B., Robinson, C., & Funk, W. (2020). Methane emissions detection, attribution, and quantification at upstream oil and gas facilities – a comparison of two truck systems and optical gas imaging. Report to the Petroleum Technology Alliance of Canada, 14p.

Research media coverage:

- Aerospace Testing International: Why stronger standards and better weather testing is needed for drones (February 02, 2022)
- Yahoo Finance: Drones are flying into weather data deserts. Can they be stopped? (September 14, 2021)
- UToday: Disaster-mapping drones often neglect deadliest, costliest events and hardest-hit areas (August 23, 2021)
- The Conversation: Disaster-mapping drones often neglect deadliest, costliest events and hardest-hit areas (August 11, 2021)
- National Post: The weather's effects on commercial drones may hinder their widespread use (June 21, 2021)
- The Weather Network: The weather's effects on commercial drones may hinder their widespread use (June 21, 2021)
- UToday: The weather's effects on commercial drones may hinder their widespread use (June 23, 2021)
- The Conversation: The weather's effects on commercial drones may hinder their widespread use (June 20, 2021)