Nikhil Dadheech

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Education

PhD, Climate and Data Science, University of Washington Seattle, WA (Sept. 2021 – Present)
Advisor: Dr Alex Turner

MS, Atmospheric Sciences, University of Washington Seattle, WA (Sept. 2021 – Mar. 2024)
Advisor: Dr Alex Turner

BTech, Civil Engineering, Indian Institute of Technology New Delhi, India (Jul. 2015 – May. 2019)
Advisor: Dr Mukesh Khare

Experience

University of Washington Sept. 2021 – Present
*Graduate Research Assistant (**NASA FINESST fellow**)* *Seattle, WA*

- Performing real-time GHG emission monitoring from satellite and surface observations using machine learning.
- Emulated atmospheric transport using computer vision to address computational issues in physics-based models.
- Developed a machine learning model to identify methane plumes from space using Landsat and Sentinel satellites.

Innoplexus July 2019 – Sept. 2021
Data Scientist, Innovation team *Pune, India*

- Developed deep learning models for biomedical entity recognition, relationship extraction, and entity normalization
- Created a biomedical knowledge graph of 350M nodes and 1.5B relationships for computing graph embeddings.

Innoplexus May 2018 – July 2018
Data Science Intern, Entity Normalization team *Pune, India*

- Developed a Named Entity Recognition model using deep learning for entity normalization and disambiguation.
- Received a **full-time offer** as a data scientist for exemplary performance and accomplishment of deliverables.

Awards

- Future Investigators in NASA Earth and Space Science and Technology (**funding PhD**; Sept. 2022 – Present)
- Integral Environment Big Data Research Fund (2021 – 2022)
- Department of Atmospheric Sciences Scholar Award (2021)
- Centre of Excellence for Research on Clean Air Grant (2019)
- IIT Delhi Department of Civil Engineering Best B.Tech. Project (Mr. & Mrs. Prem Sheel Bhatnagar Award 2019)
- Freedom of Kumaon House Award, IIT Delhi (2019)
- Kishor Vaigyanik Protsahan Yojana Scholarship (2015)
- Dakshana Foundation Scholarship (2013 – 2019)

Relevant Projects

Machine Learning Emulator for Atmospheric Transport (FootNet) July 2022 – Present
PhD Thesis Chapter (Funded by NASA FINESST; manuscript under review)

- Developed a deep learning model using U-Net which computes surface sensitivities for atmospheric observations.
- Accelerated computation of atmospheric transport by **1000x** using machine learning emulator.
- Currently training a generalized model with 500,000 data points (15TB space) using Distributed Data Parallel.

Near-Real-Time Greenhouse Gas Emission Monitoring from Space Sept. 2023 – July 2024
PhD Thesis Chapter (Funded by NASA FINESST; manuscript under review)

- Using satellites (TROPOMI, MethaneSAT, OCO-2/3) and surface observations to monitor real-time emissions.
- Parallelized the framework to efficiently analyze high-resolution data with matrices of dimensions 15M $\times$ 15M.
- Successfully integrated machine learning emulator outputs into the GHG emission monitoring pipeline.

Methane Plumes Detection from Space May 2024 – Present

PhD Thesis Chapter

- Creating a **40+ years** of record of methane plumes observed from space using Landsat and Sentinel satellites.
- Developing a U-Net model that identify methane plumes from satellite bands using image semgentation techniques.

Satellite Bands Inpainting for Landsat7 Missing Data May 2024 – Present

PhD Thesis Chapter

- Developing an inpainting model using generative AI to fill missing stripe data in Landsat 7 due to failed sensors.
- Actively using state-of-the-art models such as diffusion models and generative adversarial networks for inpainting.

Characteristics of Photochemical Pollutants over Indo-Gangetic Plain 2018 – 2019

Undergraduate Research Thesis

- Selected for the **Best BTech Project** Award bestowed to only one student in the entire graduating class.
- Developed regression models using Random Forest to predict the ozone concentrations over Indo-Gangetic Plain.

Publications

Dadheech, N.*, He, T. L.*, and Turner, A. J. (2024). High-resolution greenhouse gas flux inversions using a machine learning surrogate model for atmospheric transport. EGUsphere, 2024, 1-21. (*in review*; * Equally contributed authors)

He, T. L*., **Dadheech, N.***, Thompson, T. M., and Turner, A. J. (2024). FootNet: Development of a machine learning emulator of atmospheric transport. (*in review*; * Equally contributed authors)

Hamilton, S.D., Wu D., Johnson M.S., Turner A.J., Fischer M.L., **Dadheech N.**, and Jeong S. (2024). Estimating carbon dioxide emissions in two California cities using Bayesian inversion and satellite measurements, (*in review*).

Shukla, K., **Dadheech, N.**, Kumar, P., and Khare, M. (2021). Regression-based flexible models for photochemical air pollutants in the national capital territory of megacity Delhi. Chemosphere, 272, 129611.

Extracurricular Activities

Department Colloquium Committee Member May. 2024 – Present

Graduate Student member

- Collaborating with professors in the department to invite external speakers for the weekly colloquium series.
- Encourage students to host external speakers for the colloquium series and ensure diversity among speakers.

Student Advisory Council Sept. 2021 – Dec. 2022

Graduate Student Advisor

- Elected student member of the council of the dean of the college of environment at the University of Washington.
- Advocated the students voices on the topics that impact students, promoted interdisciplinary college community.

Hindi Theatre

Actor and Director

- Directed and acted in 10+ hindi plays at professional and competitive college levels.
- Mentored junior team members, organized theatre workshops for beginners and directed plays.

Classes

Courses: Deep Learning, Machine Learning for Big Data, Introduction to Parallel Computing with GPUs, Ensemble Prediction Systems, Probability Theory and Stochastic Processes,

Skills & Interests

Computing: Python, PyTorch, Parallel Computation, Remote Sensing

Interests: Cooking, Archery, Hiking, Science outreach, Theatre