Yuhao Nie

Contact Information

Massachusetts Institute of Technology
77 Massachusetts Avenue
Cambridge, MA 02139, United States

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Website: https://yuhao-nie.github.io/
Google Scholar

Research Interests

Energy Meteorology; Energy Systems Modeling; Environmental Impacts Assessment; Sustainable Development; Machine Learning; Computer Vision; Remote Sensing

Academic Appointments

Massachusetts Institute of Technology (MIT), Cambridge, United States
Michael Hammer Postdoctoral Fellow, 2023–Present
Institute for Data, Systems, and Society; Laboratory for Information & Decision Systems
Advisor: Sherrie Wang

Education

Stanford University, Stanford, United States
Ph.D. in Energy Science and Engineering, 2023
Dissertation: Short-term Solar Forecasting from All-sky Images Using Deep Learning
Advisor: Adam Brandt

University of British Columbia (UBC), Vancouver, Canada
M.A.Sc. in Chemical Engineering (Energy Systems), 2018
Thesis: Life Cycle and Techno-economic Assessment of Transportation Biofuels from Hydrothermal Liquefaction of Forest Residues in British Columbia
Advisor: Xiaotao Bi

Harbin Institute of Technology (HIT), Harbin, China
B.Eng. in Environmental Engineering (with honors), 2015

Honors and Awards

Eni Energy Fellowship (US$150,000 for 1 year)	2024
Michael Hammer Postdoctoral Fellowship (US$136,000 over 2 years)	2023
Mitacs Accelerate Program Fellowship (CA$30,000 over 10 months)	2017
UBC Faculty of Applied Science Graduate Award (CA$52,000 over 2 years)	2015
Mitacs Globalink Graduate Fellowship (CA$15,000 for 1 year)	2015
HIT Outstanding Graduate	2015
Mitacs Globalink Research Award	2014
Endress+Hauser Scholarship	2013
HIT Scholarship for Academic Excellence	2012
National Scholarship, Ministry of Education, China	2012

Papers in Progress

(* denotes corresponding author, † denotes equal contribution, _ denotes advised student)

[1] **Satellite Earth Observation for the Energy Transition**
Quentin Paletta*, Max Aragon, Beatrice Barresi, Zoltan Bartalis, Nicolas Bellouin, Hannah Bloomfield, Christian Borget, Olivier Boucher, Ethan Burkley, Antony Delavois, Laurent Dubus, Darlain Edeme, Paul Elsner, Sofia Ferdini, Florian Le Guillou, Charlotte Bay Hasager, Gabriel Kasmi, **Yuhao Nie**, Antonio Elia Pascarella, Emanuele Quaranta, Marie-Helene Rio, Zoltan Szantoi, Drazen Tumara, Alberto Troccoli, Andreas Uihlein, Xinyue Wang, and Zhan Zhang (In alphabetical order)
In preparation, 2025+

[2] **Mapping Rice Water Management and Methane Emissions in Ghana**
Yuhao Nie, and Sherrie Wang*
In preparation, 2025+

[3] **SkyImageNet: A Large-scale Sky Image Database for Solar Energy Meteorology**
Stephen Campbell†, **Yuhao Nie**†,*, Max Aragon, Adam Brandt, Samer Chaaraoui, Tao Jing, Mengying Li, Stefanie Meilinger, Quentin Paletta, Andea Scott, Sherrie Wang, Yupeng Wu, and Liwenbo Zhang (In alphabetical order)
In preparation, 2025+

[4] ***skyimglib*: A Python Library for Accessing, Processing, and Modeling Sky Imagery Data for Solar Energy Meteorology**
Stephen Campbell, **Yuhao Nie***, Adam Brant, Jack Camier, Samer Chaaraoui, Adam Jensen, Florian Kotthoff, Quentin Paletta, Andea Scott, and Sherrie Wang (In alphabetical order)
In preparation, 2025+

Peer-reviewed Publications

[1] **Sky Image-based Solar Forecasting Using Deep Learning with Heterogeneous Multi-location Data: Dataset Fusion *versus* Transfer Learning**
Yuhao Nie*,†, Quentin Paletta*,†, Andea Scott, Luis Marthin Pomares, Guillaume Arbod, Sgouris Sgouridis, Joan Lasenby, and Adam Brandt
Applied Energy 369 (2024): 123467

[2] **SkyGPT: Probabilistic Ultra-short-term Solar Forecasting Using Synthetic Sky Images from Physics-constrained VideoGPT**
Yuhao Nie*, Eric Zelikman†, Andea Scott†, Quentin Paletta, and Adam Brandt
Advances in Applied Energy 14 (2024): 100172 [GitHub]

[3] **Improving Cross-site Generalisability of Vision-based Solar Forecasting Models with Physics-informed Transfer Learning**
Quentin Paletta*, **Yuhao Nie**, Yves-Marie Saint-Drenan, and Bertrand Le Saux
Energy Conversion and Management 309 (2024): 118398

[4] **Open-source Sky Image Datasets for Solar Forecasting with Deep Learning: A Comprehensive Survey**
Yuhao Nie*, Xiatong Li, Quentin Paletta, Max Aragon, Andea Scott, and Adam Brandt
Renewable and Sustainable Energy Reviews 189 (2024): 113977

[5] **Advances in Solar Forecasting: Computer Vision with Deep Learning**
Quentin Paletta*, Guillermo Terrén-Serrano, **Yuhao Nie**, Binghui Li, Jacob Bieker, Wenqi Zhang, Laurent Dubus, Soumyabrata Dev, and Cong Feng
Advances in Applied Energy (2023): 100150 [Media]

[6] **SKIPP'D: A SKy Images and Photovoltaic Power Generation Dataset for Short-term Solar Forecasting**
Yuhao Nie†, Xiatong Li†, Andea Scott, Yuchi Sun, Vignesh Venugopal, and Adam Brandt*
Solar Energy 255 (2023): 171-179 [GitHub]

[7] **Resampling and Data Augmentation for Short-term PV Output Prediction based on an Imbalanced Sky Images Dataset Using Convolutional Neural Networks**
Yuhao Nie, Ahmed S. Zamzam, and Adam Brandt*
Solar Energy 224 (2021): 341-354

[8] **Greenhouse Gas Emissions of Western Canadian Natural Gas: Proposed Emissions Tracking for Life Cycle Modeling**
Ryan E. Liu, Arvind P. Ravikumar, Xiaotao Tony Bi, Siduo Zhang, **Yuhao Nie**, Adam Brandt,

and Joule A. Bergerson*
Environmental Science & Technology, 55.14 (2021): 9711-9720

[9] **PV Power Output Prediction from Sky Images Using Convolutional Neural Network: The Comparison of Sky-condition-specific Sub-models and an End-to-end Model**
Yuhao Nie, Yuchi Sun, Yuanlei Chen, Rachel Orsini, and Adam Brandt*
Journal of Renewable and Sustainable Energy, 12.4 (2020) (Journal Cover) [GitHub]

[10] **Greenhouse-gas Emissions of Canadian Liquefied Natural Gas for Use in China: Comparison and Synthesis of Three Independent Life Cycle Assessments**
Yuhao Nie, Siduo Zhang, Ryan E. Liu, Daniel Javier Roda-Stuart, Arvind P. Ravikumar, Alex Bradley, Mohammad S. Masnadi, Adam Brandt*, Joule Bergerson*, and Xiaotao Bi*
Journal of Cleaner Production 258 (2020): 120701 [Media]

[11] **Repeated Leak Detection and Repair Surveys Reduce Methane Emissions over Scale of Years**
Arvind P. Ravikumar*, Daniel Roda-Stuart, Ryan Liu, Alexander Bradley, Joule Bergerson, **Yuhao Nie**, Siduo Zhang, Xiaotao Bi, and Adam R. Brandt*
Environmental Research Letters 15.3 (2020): 034029

[12] **Optimal Design of the Power Generation Network in California: Moving towards 100% Renewable Electricity by 2045**
Wennan Long, **Yuhao Nie**, Yunan Li, and Adam Brandt*
International Journal of Energy and Power Engineering 14.2 (2020): 27-37.

[13] **Life-cycle Assessment of Transportation Biofuels from Hydrothermal Liquefaction of Forest Residues in British Columbia**
Yuhao Nie, and Xiaotao Bi*
Biotechnology for biofuels 11 (2018): 1-14

[14] **Techno-economic Assessment of Transportation Biofuels from Hydrothermal Liquefaction of Forest Residues in British Columbia**
Yuhao Nie, and Xiaotao Tony Bi*
Energy 153 (2018): 464-475

[15] **Analysis of Wind Turbine Gearbox's Environmental Impact Considering its Reliability**
L. Jiang, D. Xiang*, Y.F. Tan, **Y.H. Nie**, H.J. Cao, Y.Z. Wei, D. Zeng, Y.H. Shen, and G. Shen
Journal of cleaner production 180 (2018): 846-857

Conference Presentations

[1] **Mapping Flooding in Paddy Fields for Estimating Rice Methane Emissions in Ghana Using Remote Sensing and Machine Learning**
Yuhao Nie, and Sherrie Wang
AGU Fall Meeting, December 2024 (Scheduled)

[2] **Sky Images for Solar Forecasting and Beyond**
Yuhao Nie
International Conference of Net Zero Carbon Built Environment, July 2024 (Invited Oral)

[3] **SkyImageNet: Towards a Large-scale Sky Image Dataset for Solar Power Forecasting**
Yuhao Nie, Quentin Paletta, and Sherrie Wang
ICLR 2024 Tackling Climate Change with Machine Learning, May 2024

[4] **Sky Image Prediction Using Generative Adversarial Networks (GANs) for Solar Forecast**
Yuhao Nie, Andea Scott, Eric Zelikman, and Adam Brandt
ICML 2021 Tackling Climate Change with Machine Learning, July 2021

[5] **Short-term PV Output Prediction Using Convolutional Neural Network: Learning from an Imbalanced Sky Images Dataset via Sampling and Data Augmentation**
Yuhao Nie, Ahmed Zamzam, and Adam Brandt
NeurIPS 2020 Tackling Climate Change with Machine Learning, December 2020

[6] **Life Cycle Assessment of Bio-jet Fuel Production from Hydrothermal Liquefaction of Forest Residues in British Columbia**
Yuhao Nie, and Xiaotao Bi
Advanced Biofuels Symposium, July 2016 (Oral)

Invited Talks

Generative Models for Probabilistic Solar Forecasting
MIT LIDS Postdoc Meeting [Slides] — Sept. 2024
Applied Energy Innovation Institute Energy Visions Seminar [Slides] — July 2024
MIT LIDS Climate Tea Talk [Slides] — April 2024

Large-scale Sky Image Database and Foundation Model for Solar Forecasting
Eni Research Funding Meeting [Slides] — June 2024
Solar Energy Meteorology Round Table [Slides] — Jan. 2024

Solar Forecasting from Sky Images Using Deep learning
Stanford Energy Student Lectures [Slides] — Aug. 2021
Stanford ENERGY 293 (Energy Storage and Conversion) Guest Lecture [Slides] — April 2021
Dubai Electricity and Water Authority [Slides] — Sept. 2019

Environmental Impacts Analysis of Transportation Biofuels
UBC CEEN 523 (Energy and the Environment) Guest Lecture [Slides] — Feb. 2017

Internship

Seven Generations Energy, Vancouver, Canada (Remote)
Research Intern (Co-op) with Xiaotao Bi and Ken Woloschuk — July 2017–Feb. 2018
Project: Life Cycle Analysis of Canadian Liquefied Natural Gas for Power Generation and District Heating in China

University of Manitoba, Winnipeg, Canada
Research Intern with Qiuyan Yuan — Summer 2014
Project: Pre-treatment of Landfill Leachate and Municipal Wastewater Mixture

Teaching Experience

TA, Stanford ENERGY 291: Optimization of Energy Systems [Evaluation] — Spring 2021
Trainee, UBC Instructional Skills Workshop — June 2017
Co-instructor, UBC CHBE 366: Chemical Engineering Laboratory — Winter 2016

Mentoring

Stephen Campbell, MIT BS (Currently MIT MEng) — Feb. 2024–Present
Lama El Halabi, Stanford PhD — Sept. 2022–July 2023
Xiatong Li, Stanford MS (Currently Princeton PhD) — March 2022–Dec. 2022
Solomon Kim, Stanford BS (Currently Stanford MA) — Sept. 2021–Nov. 2021
Andea Scott, Stanford MS (Currently Stanford PhD) — Sept. 2020–July 2023

Professional Service

Workshop Program Committee
NeurIPS 2024 Workshop on Tackling Climate Change with Machine Learning

Session Chair
1st International Conference of Net Zero Carbon Built Environment 2024

Journal Reviewer
Solar Energy, Journal of Cleaner Production, IEEE Transactions on Power Systems, IEEE Journal of

Photovoltaics, Computers and Electrical Engineering, Energies, Journal of Renewable and Sustainable Energy

Conference Reviewer
NeurIPS 2024 Workshop on Tackling Climate Change with Machine Learning

Member
Society of Petroleum Engineers (SPE), American Geophysical Union (AGU)

REFERENCES

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