Yuhao Nie

Contact Information

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Research Interests

Solar forecasting; Energy system modeling; Environmental impacts assessment; Computational sustainability; Remote sensing; Computer Vision; Machine learning

Academic Appointments

Massachusetts Institute of Technology (MIT) — Cambridge, United States
Michael Hammer Postdoctoral Fellow — October 2023 - Present
- Affiliation: Institute for Data, Systems, and Society
- Host: Sherrie Wang

Education

Stanford University — Stanford, United States
Ph.D., Energy Science and Engineering — September 2023
- Dissertation: Short-term solar forecasting from all-sky images using deep learning [DOI]
- Advisor: Adam Brandt

University of British Columbia (UBC) — Vancouver, Canada
M.A.Sc., Chemical Engineering — July 2018
- Thesis: Life cycle and techno-economic assessment of transportation biofuels from hydrothermal liquefaction of forest residues in British Columbia [DOI]
- Advisor: Xiaotao Tony Bi

Harbin Institute of Technology (HIT) — Harbin, China
B.Eng., Environmental Engineering — June 2015

Honors and Awards

Michael Hammer Postdoctoral Fellowship, MIT	2023
Mitacs Accelerate Program Fellowship, Mitacs Canada	2017
Faculty of Applied Science Graduate Fellowship, UBC	2015
Mitacs Globalink Graduate Fellowship, Mitacs Canada	2015
Outstanding Graduate, HIT	2015
Second Prize, Undergraduate Scientific Innovation Program, HIT	2014
Outstanding Student Award, Ministry of Education of Heilongjiang Province, China	2014
Endress+Hauser Scholarship, Endress+Hauser Flowtec (China) Co., Ltd.	2013
Scholarship for Academic Excellence, HIT	2013
National Scholarship, Ministry of Education of China	2012

Papers in Progress

* denotes corresponding author(s), † denotes equal contributions

[1] Q. Paletta*, **Y. Nie**, Y.M. Saint-Drenan, B.L. Saux. Improving cross-site generalizability of vision-based solar forecasting models with physics-informed domain adaptation. 2023+. (Under Review)

[2] **Y. Nie***,†, Q. Paletta*,†, A. Scott, L. M. Pomares, G. Arbod, S. Sgouridis, J. Lasenby, A. Brandt. Sky-image-based solar forecasting with heterogeneous multi-location data: Dataset fusion versus transfer learning. 2023+. (Under review) [arXiv]

[3] **Y. Nie***, E. Zelikman†, A. Scott†, Q. Paletta, A. Brandt. SkyGPT: Probabilistic short-term solar forecasting using synthetic sky videos from physics-constrained VideoGPT. 2023+. (Under review) [arXiv][GitHub]

Peer-reviewed Publications

[1] **Y. Nie***, X. Li, Q. Paletta, M. Aragon, A. Scott, A. Brandt. Open-source sky image datasets for solar forecasting with deep learning: A comprehensive survey. *Renewable and Sustainable Energy Reviews*, 2024. [DOI]

[2] Q. Paletta*, G. Terrén-Serrano, **Y. Nie**, B. Li, J. Bieker, W. Zhang, L. Dubus, S. Dev, C. Feng*. Advances in solar forecasting: Computer vision with deep learning. *Advances in Applied Energy*, 2023. [DOI][Media]

[3] **Y. Nie**†, X. Li†, A. Scott, Y. Sun, V. Venugopal, A. Brandt*. SKIPP'D: A SKy Images and Photovoltaic Power generation Dataset for short-term solar forecasting. *Solar Energy*, 2023: 171-179. [DOI] [GitHub]

[4] **Y. Nie**, A. Zamzam, A. Brandt*. Resampling and data augmentation for short-term PV output prediction based on an imbalanced sky images dataset using convolutional neural networks. *Solar Energy*, 2021: 341-354. [DOI]

[5] R. E. Liu, A. P. Ravikumar, X. T. Bi., S. Zhang, **Y. Nie**, A. Brandt, J. Bergerson*. Greenhouse gas emissions of Western Canadian natural gas: Proposed emissions tracking for life cycle modeling. *Environmental Science & Technology*, 2021: 9711-9720. [DOI]

[6] **Y. Nie**, Y. Sun, Y. Chen, R. Orsini, A. Brandt*. 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. *Journal of Renewable and Sustainable Energy*, 2020. (**Featured on the journal cover**) [DOI][GitHub]

[7] W. Long, **Y. Nie**, Y. Li, A. Brandt*. Optimal design of the power generation network in California: Moving towards 100% renewable electricity by 2045. *International Journal of Energy and Power Engineering*, 2020, 14:2. [DOI]

[8] **Y. Nie**, S. Zhang, R.E. Liu, D. Roda-Stuart, A.P. Ravikumar, A. Bradley, M.S. Masnadi, A.R. Brandt*, J. Bergerson*, X.T. Bi*. Greenhouse-gas emissions of Canadian liquefied natural gas for use in China: Comparison and synthesis of three independent life cycle assessments. *Journal of Cleaner Production*, 2020. [DOI][Media]

[9] A.P. Ravikumar*, D. Roda-Stuart, R.E. Liu, A. Bradley, J. Bergerson, **Y. Nie**, S. Zhang, X.T. Bi, A.R. Brandt. Repeated leak detection and repair surveys reduce methane emissions over scale of years. *Environmental Research Letters*, 2020, 15:3. [DOI]

[10] **Y. Nie**, X. Bi*. Life cycle assessment of transportation biofuels from hydrothermal liquefaction of forest residues in British Columbia. *Biotechnology for Biofuels*, 2018, 11:23. [DOI]

[11] **Y. Nie**, X. Bi*. Techno-economic assessment of transportation biofuels from hydrothermal liquefaction of forest residues in British Columbia. *Energy*, 2018, 153:464-475. [DOI]

[12] L. Jiang, D. Xiang*, Y.F. Tan, **Y. Nie**, H.J. Cao, Y.Z. Wei, D. Zeng, Y.H. Shen, G. Shen. Analysis of wind turbine gearbox's environmental impact considering its reliability. *Journal of Cleaner Production*, 2018, 180:846-857. [DOI]

Conference Presentations

[1] **Y. Nie**, A. Scott, E. Zelikman, A. Brandt. Sky Image Prediction Using Generative Adversarial Networks (GANs) for Solar Forecasting. *ICML 2021 Tackling Climate Change with Machine Learning*, July 2021. (Poster) [HTML][Slides]

[2] **Y. Nie**, A. Zamzam, A. Brandt. Short-term PV output Prediction Using Convolutional Neural Network: Learning from an Imbalanced Sky Images Dataset via Sampling and Data Augmentation. *NeurIPS 2020 Tackling Climate Change with Machine Learning*, December 2020. (Poster) [HTML][Slides]

[3] **Y. Nie**, X. Bi. Life Cycle Assessment of Bio-jet Fuel Production from Hydrothermal Liquefaction of Forest Residues in British Columbia. *Advanced Biofuels Symposium*, Vancouver, Canada, July 2016. (Invited oral presentation) [Slides][Poster]

Research Talks

[1] MIT LIDS Climate Tea Talks, "Solar energy forecasting from sky images using deep learning", April 2024.

[2] Solar Energy Meteorology community round table, "Towards building a large-scale sky image dataset for atmospheric sciences and solar forecasting", January 2024. [Slides]

[3] Stanford Energy Student Lectures, "Training Machine Vision Systems for PV Power Output Prediction", August 2021. [Slides]

[4] Stanford ENERGY293 guest lecture, "Training Machine Vision Systems for PV Power Output Prediction" , April 2021. [Slides]

[5] Dubai Electricity and Water Authority research seminar, "Sky-condition-specific sub-models for solar forecasting using sky images", September 2019. [Slides]

[6] UBC CEEN523 guest lecture, "Life cycle assessment of bio-jet fuel production from hydrothermal liquefaction of forest residues in British Columbia", February 2017. [Slides]

Fellowship Grants

Michael Hammer Postdoctoral Fellowship, MIT, $136,000 USD 2023

Mitacs Accelerate Research Fellowship, Mitacs Canada, $30,000 CAD 2017

Mitacs Globalink Research Fellowship, Mitacs Canada, $4,500 CAD plus travel fund 2014

Internship

Seven Generations Energy Ltd. (7Gs) Vancouver, Canada

Research Intern, Mitacs Accelerate Program (Co-op) July 2017 - February 2018

- Advisors: Prof. Xiaotao Tony Bi (UBC) and Ken Woloschuk (7Gs)
- Project: Life cycle analysis of Kakwa derived liquefied natural gas for power generation and district heating in China [DOI1, DOI2, DOI3]

University of Manitoba Winnipeg, Canada

Research Intern, Mitacs Globalink Research Internship Program Summer 2014

- Advisor: Prof. Qiuyan Yuan
- Project: Pre-treatment of Landfill Leachate and Municipal Wastewater Mixture

Teaching Experience

Stanford University Stanford, United States

- Teaching Assistant, ENERGY 291: Optimization of Energy Systems Spring 2021
  Held office hours for class of 29 students; graded problem sets and mentored project.

University of British Columbia Vancouver, Canada

- Instructional Skills Workshop June 2017
- *Teaching Assistant*, CHBE 366: Chemical Engineering Laboratory Winter 2016
  Led campus steam plant trial for class of 77 students; graded reports and taught short course on mass and energy balances.

Mentoring

- Stephen Campbell, undergraduate at MIT, UROP, February 2024 - Present.
- Lama El Halabi, PhD at Stanford, Environmental Assessment and Optimization (EAO) Group, September 2022 - July 2023.
- Andea Scott, PhD at Stanford, EAO Group, September 2020 - July 2023.
- Xiatong Li, Master at Stanford, EAO Group, March - December 2022. (now PhD at Princeton)
- Solomon Kim, undergraduate at Stanford, EE292D project advisor, September - November 2021.

Academic Services

Journal Reviewer

- Solar Energy, Journal of Cleaner Production, Computers and Electrical Engineering

Conference Convener & Session Chair

- International Conference of Net Zero Carbon Built Environment (2024), Session: AI in Microclimate, Nottingham, UK.