Yuhao Nie

CONTACT
INFORMATION

Department of Energy Science and Engineering
367 Panama Street, Stanford, CA 94305

ynie@stanford.edu
https://yuhao-nie.github.io/

RESEARCH TOPICS Solar forecasting; Deep learning; Environmental impacts analysis; Energy systems optimization

EDUCATION

Stanford University, Stanford, United States
Ph.D. Candidate in Energy Science and Engineering   September 2023
Advised by Professor Adam Brandt

University of British Columbia, Vancouver, Canada
M.A.Sc. in Chemical Engineering, GPA: 90.3/100.0   July 2018
Advised by Professor Xiaotao Tony Bi

Harbin Institute of Technology, Harbin, China
B.Eng. in Environmental Engineering, GPA: 93.0/100.0   June 2015
Advised by Professor Kai Sun

PEER-REVIEWED
PUBLICATIONS

Google Scholar Profile | Citations: 324; h-index: 8; i10-index: 8

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

[1] **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. [HTML] [GitHub]

[2] **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. [HTML]

[3] 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. [HTML]

[4] **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 Submodels and an End-to-end Model, *Journal of Renewable and Sustainable Energy*, 2020. **(Featured on the journal cover)** [HTML]

[5] 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. [HTML]

[6] **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. [HTML]

[7] 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. [PDF]

[8] **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. [PDF]

[9] **Y. Nie**, X. Bi*. Techno-economic Assessment of Transportation Biofuels from Hydrothermal Liquefaction of Forest Residues in British Columbia, *Energy*, 2018, 153:464-475. [HTML]

[10] 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. [HTML]

PAPERS IN
PROGRESS

[1] 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 (In press). [HTML]

[2] **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. [arXiv]

[3] **Y. Nie***, X. Li, Q. Paletta, M. Aragon, A. Scott, A. Brandt. Open-Source Ground-based Sky Image Datasets for Very Short-term Solar Forecasting and Cloud Analysis/Modeling: A Comprehensive Survey. 2022. (Under revision) [arXiv]

[4] **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 2022. (Submitted) [arXiv]

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. [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. [HTML][Slides]

INVITED TALKS

[1] Training Machine Vision Systems for PV Power Output Prediction. *Stanford Energy Student Lectures*. August 2021. [Slides]

[2] Training Machine Vision Systems for PV Power Output Prediction. *Stanford ENERGY 293 Guest Lecture*. April 2021. [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. [Slides], [Poster]

PATENT

[1] B. Liu, **Y. Nie**, A. Chen, C. Liu. Efficient method for corn stover saccharification (in Chinese). *CN Patent*, 2016, CN103898245B.

RESEARCH
EXPERIENCE

Stanford University, Stanford, United States

1. Vision-based Short-term Solar Forecasting Using Deep Learning   PhD thesis project
Research Assistant   September 2018 - present
- Surveyed open-source sky image datasets for solar forecasting and cloud modeling. [arXiv]
- Open sourced Stanford solar forecasting dataset. [Paper, GitHub]
- Examined transfer learning for solar forecasting with multi-location data. [arXiv]
- Developed stochastic sky video prediction model for solar forecasting. [arXiv]
- Explored data augmentation for solar forecasting with an imbalanced sky image dataset [Paper]
- Developed sky-condition-specific sub-models for solar forecasting. [Paper]

2. Multi-camera Network for Solar Forecasting in Desert Condition   Industrial project
Project Member   September 2019 - present

- Collaborated with researchers from Dubai Electricity & Water Authority.
- Experimented with multi-camera sky image fusion for solar forecasting.
- Developed deep learning-based cloud images segmentation model.

3. Optimal Design of Power Generation Network in California   Selected course project

Project Member   January - March 2019
- Proposed the project idea and worked with two other students.
- Developed a binary quadratic programming model to determine the optimal locations, capacities of potential renewable power plants and phase-out schedule of existing fossil power plants to help achieve California's 100% renewable power goal by 2045 with minimal cost.
- Co-authored a conference paper. [Paper]

University of British Columbia, Vancouver, Canada

1. Integrated Assessment of Liquid Fuels from Forest Residues   Master thesis project

Research Assistant   September 2015 - June 2018
- Built life cycle and economic models for biofuels from forest residues in British Columbia.
- Compared the environmental and economic impacts of three different supply chain designs.
- Conducted sensitivity analysis and discounted cash flow rate of return analysis via Excel VBA.
- Published two journal papers. [Paper1, Paper2]

2. Multiple Objective Optimization of Biofuel Supply Chain   Selected course project

Project Leader   September - December 2016
- Built a mixed integer nonlinear programming model of biofuel supply chain bi-objective optimization problem and developed a solver in MATLAB based on interior point, branch and cut and ϵ-constraint methods.

Harbin Institute of Technology, Harbin, China

1. Synthesis of Gold Colloid for Detection of Pyrene in Water   Undergraduate capstone project

Research Assistant   October 2014 - June 2015
- Set up a micro-fluidic system to synthesize gold colloid as the substrate for detection of trace pollutant pyrene based on Surface Enhanced Raman Scattering.
- Studied the effect of residence time, capillary diameter and reactants concentration ratio on the morphology of gold nanoparticles.

2. Separation of Sugar and Acid from Corn Stover Acidolysis Solution by Electrodialysis

Project Leader, Undergraduate Scientific Innovation Program   May 2013 - April 2014
- Led two students and developed a novel corn stover saccharification method.
- Designed an electrodialysis reactor to recover the generated sugar from acidolysis solution.
- Won 2nd prize and granted a China Patent.

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

Life Cycle Analysis of Kakwa Derived LNG for Power Generation and District Heating in China

Research Intern   July 2017 - February 2018
- Collaborated with researchers from University of Calgary and Stanford on the joint project.
- Dealt with large amount of industrial operation and emissions survey data.
- Developed a life cycle model for 7Gs' hypothetical LNG supply chain independently and cross-compared the results with the other two teams.
- Completed one technical report, led the synthesis of a joint paper [Paper1], and co-authored two other papers [Paper2, Paper3].

University of Manitoba, Winnipeg, Canada

Pre-treatment of Landfill Leachate and Municipal Wastewater Mixture

Research Intern   June - September 2014
  - Funded by China Scholarship Council and Mitacs Canada as 1 of 100 undergraduates from China to do Summer research in Canadian Universities.
  - Designed and developed a pre-treatment method for landfill leachate and municipal wastewater mixture to facilitate the removal of refractory COD in landfill leachate.

TEACHING EXPERIENCE

Stanford University, Stanford, CA

Teaching Assistant   March - June 2021

ENERGY 291: Optimization of Energy Systems, 30 students
  - Created Piazza course discussion platform, held office hours, mentored projects, graded assignments and project reports.
  - Instruction effectiveness: 4.22/5 [Students' feedback]

University of British Columbia, Vancouver, Canada

Teaching Assistant and co-instructor   January - April 2016

CHBE 366: Chemical Engineering Laboratory, 60 students
  - Led on-campus steam plant trip, gave lectures on mass and energy balances, graded reports.

MENTORING

Lama El Halabi (PhD at Stanford)	September 2022 - September 2023
Andea Scott (Master at Stanford, now PhD at Stanford)	September 2020 - September 2023
Xiatong Li (Master at Stanford, now PhD at Princeton)	March 2022 - December 2022
Solomon Kim (Undergraduate at Stanford)	September - November 2021

HONORS AND AWARDS

Mitacs Accelerate Program Fellowship Award, Mitacs Canada	2017
Faculty of Applied Science Graduate Award, University of British Columbia	2015
International Tuition Award, University of British Columbia	2015
Mitacs Globalink Graduate Fellowship Award, Mitacs Canada	2015
Outstanding Graduate, Harbin Institute of Technology	2015
2nd Prize, Undergraduate Scientific Innovation Program, Harbin Institute of Technology	2014
Outstanding Student Award, Ministry of Education of Heilongjiang Province **(Top 1%)**	2014
Endress+Hauser Scholarship, Endress+Hauser Flowtec (China) Co., Ltd.	2013, 2014
Scholarship for Academic Excellence, Harbin Institute of Technology	2013, 2014
National Scholarship, Ministry of Education of China **(Top 1%)**	2012

PROFESSIONAL SERVICES

Reviewer:
Solar Energy, Journal of Cleaner Production