

Yuhao Nie

CONTACT INFORMATION

Department of Energy Science and Engineering
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RESEARCH TOPICS

Solar forecasting; Computer vision; Environmental impacts analysis; Energy systems optimization

EDUCATION

Stanford University, Stanford, United States

Ph.D. Candidate in Energy Science and Engineering

September 2018 - Present

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 (1st rank out of 67 students)

June 2015

Advised by Professor Kai Sun

PUBLICATIONS

[Google Scholar Profile](#) | Citations: 230; h-index: 8; i10-index: 7 (as of January 10, 2023)

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

JOURNAL PAPERS

- [1] **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.
- [2] 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.
- [3] **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)**
- [4] 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.
- [5] **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.
- [6] 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.
- [7] **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.
- [8] **Y. Nie**, X. Bi*. Techno-economic Assessment of Transportation Biofuels from Hydrothermal Liquefaction of Forest Residues in British Columbia, *Energy*, 2018, 153:464-475.

- [9] 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.

PRE-PRINTS

- [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. (2nd round review in Solar Energy) [[arXiv](#)] [[GitHub](#)]
- [2] **Y. Nie**^{*,†}, Q. Paletta^{*,†}, A. Scott, L. M. Pomares, G. Arbod, S. Sgouridis, J. Lasenby, A. Brandt. Sky-image-based Solar Forecasting with Multi-location Data: Training Models Locally, Globally or via Transfer Learning? (submitted to Renewable Energy) [[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 (submitted to Renewable and Sustainable Energy Reviews) [[arXiv](#)]

PAPERS IN PROGRESS

- [1] **Y. Nie**, E. Zelikman, A. Scott, A. Brandt. Stochastic Sky Video Prediction Using Physics-Constrained VideoGPT for Application in Solar Forecasting. (manuscript in preparation)
- [2] Q. Paletta, C. Feng, B. Li, G. Terrén-Serrano, **Y. Nie**, J. Bieker, S. Dev. A Review of Computer Vision-based Solar Forecasting with Deep Learning. (manuscript in preparation)

PATENT

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

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), *Stanford ENERGY 293 Guest Lecture* (April 2021). [[Slides](#)]
- [2] **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](#)]

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. [[paper](#)]
 - Open sourced Stanford solar forecasting dataset. [[paper](#), [github](#)]
 - Examined transfer learning for solar forecasting with multi-location data. [[paper](#)]
 - Developed stochastic sky video prediction model for solar forecasting. [[paper in preparation](#)]
 - 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 Energy & 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 Undergraduate Scientific Innovation Program
Project Leader 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 manuscript [[paper1](#)], and co-authored two other manuscripts [[paper2](#), [paper3](#)].

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|--------------------------|---|---------------------------|
| | University of Manitoba, Winnipeg, Canada | |
| | Pre-treatment of Landfill Leachate and Municipal Wastewater Mixture | |
| | <i>Research Intern</i> | June - September 2014 |
| | <ul style="list-style-type: none"> 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 | |
| | <i>Teaching Assistant</i> | March - June 2021 |
| | <i>ENERGY 291: Optimization of Energy Systems, 30 students</i> | |
| | <ul style="list-style-type: none"> 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 | |
| | <i>Teaching Assistant and co-instructor</i> | January - April 2016 |
| | <i>CHBE 366: Chemical Engineering Laboratory, 60 students</i> | |
| | <ul style="list-style-type: none"> Led weekly on-campus steam plant trip, lectured on mass and energy balances, graded reports. | |
| MENTORING | Lama El Halabi (PhD student at Stanford) | September 2022 - Present |
| | Xiatong Li (Master student at Stanford) | March 2022 - Present |
| | Andea Scott (Master student, now PhD student at Stanford) | September 2020 - Present |
| | 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 |
| | 2 nd 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 | Journal reviewer: | |
| | Solar Energy, Journal of Cleaner Production | |