

Xin CHEN

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EDUCATION

University of California, Berkeley; GPA: 3.81/4.00 Sept 2019 - 2024 (expected)

- **Ph.D.** in Material Science & Engineering | Advisor: Dr. Anubhav Jain, Prof. Gerbrand Ceder
- Minor in **Artificial Intelligence & Materials Informatics**
- Research: Data analytics, computer vision and machine learning in photovoltaic (PV) module degradation

Graduate Certificate in Applied Data Science, University of California, Berkeley

Master of Computer Science, Georgia Institute of Technology (Concurrent) Sep 2023 – 2025 (expected)

Shanghai Jiao Tong University (SJTU); GPA: 90/100; Rank: 2/114 Sept 2015 - Jun 2019

- **B.S. (Honor)** in Material Science & Engineering | Advisor: Prof. Hong Zhu
- Research: Atomic-scale simulation of lithium-ion batteries

University of Oxford July 2018 - Sep 2018

- Student researcher in Department of Materials | Advisor: Prof. Chris Grovenor
- Research: Fabrication of solid-state electrolytes

University of California, Berkeley; Summer School; GPA: 4.0/4.0 July 2017 - Aug 2017

WORK EXPERIENCE

Lawrence Berkeley National Lab | Graduate Student Researcher Aug 2019 – Current

- Build machine learning systems and apply data science methods to solar energy research and industry

PUBLICATIONS & CONFERENCES

- **X. Chen**, *et al.*, A. Jain "Automatic Crack Segmentation and Feature Extraction in Electroluminescence Images of Solar modules", *IEEE Journal of Photovoltaics* [Invited paper, revision submitted]
- C. Libby, B. Paudyal, **X. Chen** (co-first authors), *et al.*, "Analysis of PV Module Power Loss and Cell Crack Effects due to Accelerated Aging Tests and Field Exposure", *IEEE Journal of Photovoltaics* (2022)
- **X. Chen**, *et al.*, A. Jain "Automated Defect Identification in Electroluminescence Images of Solar Modules", *Solar Energy* (2022)
- T. Mousavi, **X. Chen**, *et al.*, C. R. M. Grovenor. "Fabrication of $\text{Li}_{1+x}\text{Al}_x\text{Ge}_{2-x}(\text{PO}_4)_3$ thin films by sputtering for solid electrolytes." *Solid State Ionics* (2020)
- Z. Xu, **X. Chen**, *et al.*, H. Zhu. "Anion charge and lattice volume dependent lithium-ion migration in compounds with fcc anion sublattices." *npj Computational Materials* (2020)
- Z. Xu, **X. Chen**, *et al.*, H. Zhu. "Influence of anion charge on Li-ion diffusion in a new solid-state electrolyte, Li_3La_6 ." *Chemistry of Materials* (2019)
- **X. Chen**, PV-VISION: <https://github.com/hackingmaterials/pv-vision>
- **X. Chen**, *et al.*, A. Jain "Automated Defect Identification in Electroluminescence Images of Solar Modules", *World Congress on Artificial Intelligence in Materials & Manufacturing* (AIM 2022)
- **X. Chen**, *et al.*, A. Jain "Automatic Crack Segmentation in Electroluminescence Images of Solar Modules and Maximum Inactive Area Prediction", *49th IEEE Photovoltaic Specialists Conference* (49th PVSC)
- **X. Chen**, *et al.*, A. Jain "PVPRO: a software tool and analysis method to extract degradation mechanisms from production data", *NREL Photovoltaic Reliability Workshop* (PVRW 2022)

RESEARCH & PROJECTS

Optimization of solar module design with interpretable machine learning June 2022 – Current

- **Exploratory Data Analysis & Feature Engineering** of solar module bill-of-materials (BOM) data
- Correlating BOM data with solar module degradation using machine learning models (**Random Forest Regressor, XGBoost, Multi-layer Perceptron**, *etc.*)
- Interpreting black-box models with **SHapley Additive exPlanations (SHAP)** to determine main design factors influencing solar module durability

PV-Vision: an open-source computer vision package Sep 2019 - Current

- Published the object-oriented-programming (OOP) Python package at **PyPI**

- Developed **computer vision tools** to do automatic **perspective transform** and cell **cropping**, with accuracy **over 90%**
- Built a **deep learning system** to do automatic detection and segmentation of solar module defects

Automatic defect identification in PV modules

June 2020 - Sep 2021

- Pre-processed field distorted EL images using semantic segmentation with **IoU of 99%**
- Developed **multi-class classification** of defective solar cells with average **F1 score of 0.87/1.00**
- Fine-tuned **object detection model (YOLO)** to track defective cells on PV module
- Analyzed the **statistical influence** of fire damage on a large-scale field EL image dataset (**2.4 million cells**)
- **Oral presentation** at *World Congress on Artificial Intelligence in Materials & Manufacturing (AIM 2022)*
- **Paper** published at *Journal of Solar Energy*

Automatic crack segmentation and feature extraction of PV modules

Sep 2019 – June 2022

- Fine-tuned a **UNet model** with pretrained **VGG16 backbone** to segment solar cell cracks, with **F1 score of 0.88/1.00**
- Designed algorithms of predicting the worst-case degradation area, with **correlation coefficient of 0.99/1.00**
- Designed algorithms of extracting crack features (e.g., crack length) from EL images
- **Oral presentation** and **publication** at *49th IEEE Photovoltaic Specialists Conference (PVSC 49)*
- **Paper** invited to publish on *IEEE Journal of Photovoltaics*

Time-series IV parameters extraction and degradation analysis of PV systems

July 2020 - Feb 2021

- Maintaining and developing PV degradation analysis tool *PVPRO*
- Data mining of large-scale PV systems (over **2 million rows**) and extract hidden time series IV parameters
- **Oral presentation** at NREL Photovoltaic Reliability Workshop (PVRW 2022)
- **Paper** submitted to *Journal of Solar Energy*

Effects of Charge Distribution on Lithium-Ion Diffusivity

Sep 2018 - June 2019

- Simulated a new electrolyte material Li_3MI_6 ($\text{M}=\text{La}, \text{Sc}, \text{Y}$) and analyzed effects of charge distribution on lithium migration with Density Functional Theory (DFT)
- Calculated the diffusion barrier with Nudged Elastic Band (NEB) method and ionic conductivity via Ab-initio Molecular Dynamics Simulation (AIMD)
- Predicted the stability of the electrolyte materials by computing phonon dispersion, phase diagram, band structure and electrochemical window
- Published two papers at *Journal of Chemistry of Materials* and *NPJ Computational Materials*

Fabricating LAGP Thin Films Solid-State Electrolytes

Jul 2018 - Sep 2018

- Fabricate $\text{Li}_{1.5}\text{Al}_{0.5}\text{Ge}_{1.5}(\text{PO}_4)_3$ (LAGP) thin-film electrolytes by magnetron plasmon sputtering
- Optimized the ionic conductivity to 1.24×10^{-4} S/cm, tested by Electrochemical Impedance Spectroscopy (EIS)
- Published a paper at *Solid State Ionics*

SKILLS

- Programming language: Python, JAVA, C++, MATLAB, SQL
- Programming tool: Pytorch, Tensorflow, Scikit-learn, Numpy, OpenCV, Scikit-image, Pandas, Matplotlib, Seaborn, GCP, AWS, Heroku, Docker, Git, VASP

AWARDS/HONORS/SCHOLARSHIPS

- Rong Chang Science and Technology Innovation Scholarship (top 0.2%) Oct 2018
- Honorable Mention in Mathematical Contest in Modeling (the USA) Apr 2018
- 2nd Prize of the Undergraduate Mathematical Contest in Modeling (China) Nov 2017

LEADERSHIP AND ACTIVITIES

Director of Media Center at Student Union, SJTU

May 2016 - Feb 2018

- Designed posters, activity videos, school uniform and mascot, etc.
- Rewarded with Excellent Department and Excellent Director in 2017

Vice Director of Sunlight Project Volunteer Club, SJTU

March 2017 - Sept 2017

- Organized voluntary activities to help children with autism