

# Benjamin G. Pierce

[pierce@case.edu](mailto:pierce@case.edu) – (614) 787-8389 – Cleveland, OH – [bp0017.github.io](https://github.com/bp0017)

---

## RESEARCH INTERESTS

Photovoltaics   Machine Learning   Computer Vision   Distributed Computing

---

## EDUCATION

### Case Western Reserve University

B.S. Computer Science/ M.S. Computer Science

Aug 2017 – Expected May 2021/2022

Cleveland, OH

- GPA: 3.6
- Coursework: Machine Learning, Databases, Theoretical Computer Science, Software Engineering, etc.
- Dual Degree Program- B.S./M.S. completed simultaneously

---

## EXPERIENCE

### Sandia National Laboratories

R&D Intern- Photovoltaic Systems Evaluation Laboratory

May 2020 – Present

Albuquerque, NM

*Improving Single Axis Tracking Algorithms Using Sky Imagery and Machine Learning*

- Supervisors: Joshua Stein, Jennifer Braid, Daniel Riley
- Objective: Improve energy yield of single axis trackers via a new, machine learning based control algorithm that takes sky images as input
- Cleaned data set of over 100K images (months of 1 minute interval data) in Sandia HPC environment
- Created novel multi-input convolutional neural network to find angle of maximal irradiance
- Model gives a mean absolute percent error of under 5% on most days

### Solar Durability and Lifetime Extension Center

Research Assistant

Aug 2018 – Present

Cleveland, OH

*Video/Image Processing on Crystal formation on Ni-Al alloys*

- Faculty: Roger French, Jennifer Carter, Masayoshi Adachi, Hiroyuki Fukuyama
  - Collaborated on a joint project with researchers from Tohoku University, Japan
- Objective: Analyze video of rotating, molten droplet of NiAl with the aim of determining a rate of crystallization
- Analyzed over 100,000 images across 4 samples at varying temperature and composition
- Confirmed theoretical Avrami crystallization behavior with data-driven model

*Feature Extraction and Unsupervised Learning on Electroluminescence Images*

- Faculty: Roger French, Jennifer Braid
- Objective: Use unsupervised learning to classify types of degradation of solar modules through electroluminescence images in a dataset of 11,000 images
- Experiments: Took electroluminescence measurements on mini-modules and adjusted data processing step to enable further analysis
- Extracted local features (blots of corrosion, darkening) using algorithms such as SIFT and KAZE

- Found module-level features with Haralick/GLCM features and specialized extraction methods
- Modeled local features using bag-of-words model, and applied hierarchical clustering to identify classes

## Edifice Analytics

Software Engineer

Oct 2020 – Present

Cleveland, OH

- Employee #2 of fast-moving startup working with U.S. DoD/ESTCP/ARPA-E
- Managing web dashboard for application conducting virtual energy audits on buildings
- Automated figure generation step of processing pipeline using SLURM fleet jobs in a high performance computing cluster

---

### PUBLICATIONS

- **Benjamin G Pierce**, Ahmad Maroof Karimi, Jiqi Liu, Roger H French, and Jennifer L Braid. "Identifying Degradation Modes of Photovoltaic Modules Using Unsupervised Machine Learning on Electroluminescence Images" *IEEE Photovoltaics Specialists Conference 2020*
- Carolina M. Whitaker, **Benjamin G Pierce**, Ahmad Maroof Karimi, Roger H French, and Jennifer L Braid. "PV Cell Cracks and Impacts on Electrical Performance" *IEEE Photovoltaics Specialists Conference 2020*
- Ahmad Maroof Karimi, Justin S Fada, Nicholas A Parrilla, **Benjamin G Pierce**, Mehmet Koyutürk, Roger H French, and Jennifer L Braid. "Generalized and Mechanistic PV Module Performance Prediction from Computer Vision and Machine Learning on Electroluminescence Images." *IEEE Journal of Photovoltaics*
- **Benjamin Pierce**, Ahmad Karimi, Laura Wilson, Andrew Loach, Sonoko Hamaya, Justin Fada, Masayosi Adachi, Hiroyuki Fukuyama, Roger H. French, and J.L.W. Carter. 2019. "Image Processing on Crystallization Growth of Rotating and Levitated Alloys." Poster, 2019 CWRU/Tohoku Symposium on Data Science in Life Sciences and Engineering, August 5.

---

### AWARDS

DOE Science Undergraduate Laboratory Internships (SULI)  
Offered SULI funding for Summer 2020, declined for Sandia

Lawrence Berkeley National Lab  
May 2020

SURES Scholar

Awarded grant funding for summer research

CWRU SOURCE

May 2019

Choose Ohio First Awardee- Data Science Cohort

Recognized for STEM skills and awarded scholarship for education in data science

State of Ohio

Aug 2017-

---

### TECHNOLOGIES

Programming Languages

Libraries

Databases

Other

Python, R, Java, C, bash  
Tensorflow/Keras, NumPy, sklearn, scipy, openCV, pandas  
Hadoop2/Hbase, MySQL  
High-performance computing, L<sup>A</sup>T<sub>E</sub>X, Jira, Kanban, Git, vim

---

### ACTIVITIES

Association for Computing Machinery

Institute of Electrical and Electronics Engineers

Study Abroad

Student Member, 2019

Student Member, 2020

Cape Town, South Africa, Summer 2018