

# PRAVINI S. FERNANDO

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## EDUCATION

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**State University of New York at Binghamton, USA**

*August 2017 - present*

PhD in Physics

GPA: 4.00/4.00

Anticipated graduation: Summer 2023

**University of Colombo, Sri Lanka**

*January 2013 - January 2017*

Bachelor of Science, Specialization in Physics

GPA: 3.93/4.00

Ranked first in the Faculty of Science

## RESEARCH SUMMARY

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Exploring nanoscale structure - electronic property relationships of organic polymer and small molecule photovoltaic materials using combined microscopic techniques.

## RESEARCH AND PROFESSIONAL EXPERIENCE

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### RESEARCH EXPERIENCE

**State University of New York at Binghamton, USA**

August 2018 - Present

*Research done in fulfillment of PhD*

- Developed a novel conductive atomic force microscopy (C-AFM) based procedure to quantify lateral electrical connectivity in bulk heterojunction (BHJ) solar cell active layers.
- Analyzed synchrotron based grazing incidence X-ray diffraction (GIXD) data of organic thin films to quantify crystalline population, crystalline size and the percentages of face-on and edge-on molecular orientations.
- Conducted co-localized TEM/C-AFM measurements for local structure - electronic function analysis.
- Developed an in-house MATLAB program to extract and map charge carrier mobilities through space charge limited current (SCLC) analysis in point by point current-voltage (PPIV) mapping.
- Gained experience in organic and perovskite solar cell fabrication and processing techniques including drop casting, spin coating, etching, PVD techniques such as thermal evaporation and sputtering, evaporator plate design, mask design, and plasma cleaning.
- Performed nanoscale stability measurements by mapping light induced ion migration using piezoresponse force microscopy (PFM) on perovskite solar cell active layers.
- Managed and maintained inert gloveboxes for 11 users including training new users.
- Mentored and trained a PhD student, 2 masters students and 2 undergraduate students to fabricate and characterize organic and perovskite solar cell active layers.

**National Renewable Energy Laboratory (NREL), Golden, Colorado, USA** Summer 2020

*Hands on Photovoltaic Experience (HOPE program)*

- Selected to be one of the 18 PhD students to participate in the 2020 HOPE workshop. Gained hands on experience in solar cell fabrication and PV-related characterization techniques.

**University of Colombo, Sri Lanka**

January 2016 - January 2017

*Research done in fulfillment of Bachelors Degree*

- Simulated non-linear optical properties of photonic crystals using MATLAB.

## PROFESSIONAL EXPERIENCE

### State University of New York at Binghamton, USA

August 2017 - December 2019

*Graduate Teaching Assistant, Department of Physics, Applied Physics and Astronomy*

- Planned and lead over 6 hours of discussion-based instruction per week by expanding on course topics.
- Generated curriculum-relevant problem sets for discussions, review sessions and quizzes.
- Courses: General Physics I and II (PHYS 121,122,131 and 132), Electromagnetic Theory II (PHYS 332) and Physics graduate studies prep (PHYS 496).

### State University of New York at Binghamton, USA

January 2020 - August 2020

January 2022 - August 2022

*Graduate Assistant: Research Experiences for Undergraduates (REU) in Renewable Energy Generation and Storage*

- Assisted in correspondence and facilitated evaluation of applications from over 150 applicants for NSF funded research that prioritized underrepresented students.
- Assisted in hosting workshops and seminars on renewable energy generation and storage research.
- Mentored the students in research methods and communication.

## TECHNICAL STRENGTHS

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### Experimental skills

Fabrication of organic and perovskite solar cells, thermal evaporation, sputtering, clean room experience, photo-lithography, scanning probe microscopy (SPM), conductive atomic force microscopy (C-AFM) techniques, Kelvin probe force microscopy (KPFM), piezoresponse force microscopy (PFM), point-by-point current-voltage mapping (PPIV), X-ray diffraction (XRD), grazing incidence X-ray diffraction (GIXD)

### Coding skills and platforms

Matlab, Python, ImageJ, FIT2D, Origin, Microsoft office

## AWARDS AND SCHOLARSHIPS

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1. Recipient of Harpur first year graduate award, State University of New York at Binghamton (2017).
2. Recipient of Joseph Nalliah Arumugum memorial prize for the highest academic competence in Faculty of Science, University of Colombo, Sri Lanka (2017).
3. Recipient of Gulamhusein A.J. Noorbhai prize for the best physics undergraduate research project, University of Colombo, Sri Lanka (2017).
4. Recipient of Dr. C. A. Hewawitharana memorial prize for physics, University of Colombo, Sri Lanka (2017).
5. Recipient of Mailvaganam memorial prize for physics, University of Colombo, Sri Lanka (2017).
6. Recipient of the Academic Excellence Award and scholarship for the best results of the first year examination in Science, University of Colombo, Sri Lanka (2014).

## PUBLICATIONS

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### JOURNAL PAPERS

1. “*Unambiguous Measurement of Local Hole Current in Organic Semiconductors using Conductive Atomic Force Microscopy* .” **Pravini S. Fernando**, and Jeffrey M. Mativetsky. In: The Journal of Physical Chemistry C 2023. DOI: 10.1021/acs.jpcc.3c01651
2. “*Mixed molecular orientations promote charge transport in bulk heterojunction solar cells.*” **Pravini S. Fernando**, Detlef-M. Smilgies, and Jeffrey M. Mativetsky. In: Chemical Communications 2022, 58, 5765-5768. (Featured in 2022 Chemical Communications Pioneering Investigators Issue)
3. “*Probing the contribution of lateral pathways to out-of-plane charge transport in organic bulk heterojunctions.*” **Pravini S. Fernando**, Jeremy S. Mehta, Detlef-M. Smilgies, and Jeffrey M. Mativetsky. In: Advanced Electronic Materials 2022, 2200156.
4. “*Freeing organic semiconductor nanowires from nanoporous aluminum oxide templates: effects on morphology, crystal structure, and molecular aggregation.*” Alexander M. Haruk, **Pravini S. Fernando**, Detlef-M. Smilgies, Jeffrey M. Mativetsky. In: Crystal Growth Design 2021, 21(2), 721-728.
5. “*Tuning organic semiconductor alignment and aggregation via nanoconfinement.*” Alexander M. Haruk, Collen Z. Leng, **Pravini S. Fernando**, Detlef-M. Smilgies, Yueh-Lin Loo, Jeffrey M. Mativetsky. In: The Journal of Physical Chemistry C 2020, 124(41), 22799-22807.
6. “*Colocalized nanoscale electrical and compositional mapping of organic solar cells.*” Jeremy S. Mehta, **Pravini S. Fernando**, John L. Grazul, Jeffrey M. Mativetsky. In: ACS Appl. Energy Mater. 2019, 2, 51465153.
7. “*Nonlinear optical properties of photonic crystals.*” **Pravini S. Fernando** K.A.I.L. Wijewardena Gamalath. In: World Scientific News, 2018, 97, 1-27.
8. “*Modelling All-Optical Switching and Limiting Properties of AlAs Photonic Crystals.*” **Pravini S. Fernando** K.A.I.L. Wijewardena Gamalath. In: International Letters to Chemistry Physics and Astronomy, 2018, 77, 1-14.

### POSTER PRESENTATIONS AND ABSTRACTS

- 1 “*Probing the Role of Lateral Charge Transport in Organic Solar Cell Active Layers.*” **Pravini S. Fernando** Jeremy S. Mehta, Detlef-M. Smilgies, Jeffrey M. Mativetsky In: MRS spring meeting 2021.
- 2 “*Lateral pathways contribute to out-of-plane charge transport in organic solar cell active layers.*” **Pravini S. Fernando**, Jeremy S. Mehta, Jeffrey M. Mativetsky In: Poster session at the hands on photovoltaic experience (HOPE) workshop conducted by National Renewable Energy Laboratory (NREL) 2020.
- 3 “*Role of lateral pathways in out-of-plane charge transport in organic solar cell active layers.*” **Pravini S. Fernando** Jeremy S. Mehta, Detlef-M. Smilgies, Jeffrey M. Mativetsky In: MRS Smart Energy Symposium 2019.

### CONFERENCE PAPERS

1. “*Simulating all optical switching based on 2-D nonlinear GaAs photonic crystals with side coupled microcavities.*” **Pravini S. Fernando** K.A.I.L. Wijewardena Gamalath. In: 2017 International Conference on Computational Modeling Simulation (ICCMS-2017).