

Rahul Jaiswal

Ph.D. student & Graduate Assistant at UNM

📍 Albuquerque, USA
** Willing to relocate
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I am a doctoral student with 3 years of experience in the photovoltaics industry, adept in device modeling, simulation & characterization, hardware-software prototyping, REST API development and application of machine learning in semiconductor research. My Ph.D. project is optimization of solar cell fabrication and performance using simulation and data science techniques. Professionally, I am interested in positions related to fabrication, simulation modeling, data science & web development roles.

SKILLS & ABILITIES

Programming: Python (Scikit-learn, Flask, Tkinter, NumPy, Pandas), C++, Mathematica, Front end design (HTML, CSS & JavaScript), SQL, TCL scripting.

EDA & TCAD Tools: Sentaurus TCAD, Cadence, Silvaco, COMSOL Multiphysics, LTSpice

Semiconductor Fabrication & Characterization: Oxidation, Diffusion, Lithography, Metallization (Lift off), Screen printing, Etching, ECV profiling, solar cell I-V & lifetime characterization, Ellipsometry.

Miscellaneous: Microsoft office, Linux (Debian), IoT prototyping (Arduino, & Raspberry Pi), FPGA prototyping (Spartan-6), Buildroot image development, AWS deployment.

EXPERIENCE

Graduate Assistant: University of New Mexico | 01/2019 – Ongoing | **50% capacity**

- Research duties at the Center for High Technology Materials (CHTM), Albuquerque.
- In charge for the undergraduate electronics lab.

Research Assistant: Solar Energy Research Inst. of Singapore | 03/2017 – 12/2018 | **100% capacity**

- Project member for XSolar-Hetero Project, an online web-based solar cell simulation interface (<http://xsolar-hetero.sg>).
- Team lead for device modelling, simulation & characterization of solar cells.
- Support for development of simulation web-services(REST-API's) deliverables.
- Trained on semiconductor characterization tools and responsible for data acquisition.

Research intern: Solar Energy Research Inst. of Singapore (NUS) | 01/2016– 12/2016 | **100% capacity**

- Internship project: Development of a weather reporting station prototype using open-source hardware and software.
- Team member for solar irradiance forecasting and solar irradiance data analysis.

EDUCATION

Doctor of Philosophy: Electrical Engineering | University of New Mexico | 01/19 – Ongoing | **GPA 4.01**

Master of Science: Electrical Engineering | University of New Mexico | 01/19 – 07/20 | **GPA 4.02**

Master of Engineering: Microelectronics | Birla Inst of Tech & Science, Pilani | 08/14 – 05/16 | **7.38 /10**

Bachelor of Technology: Electronics & Comm Eng. | UPTU – Lucknow | 08/10 – 06/14 | **73.7 %**

PROJECTS

Professional:

XSolar-Hetero (xsolar-hetero.sg) : Online photovoltaic simulation platform Jan 2017 – Feb 2019
Solar Energy Research Institute of Singapore

- Web-Mathematica & Python Flask library was used to create form/query-based REST API's for solar cell device & process simulation programs. (Existing analytical & numerical MATLAB simulation programs, TCAD based models were also converted to webservice)
- These REST API's were integrated with an online photovoltaic simulation platform, Xsolar- Hetero allowing web based simulation.
- Novel solar cell characterization techniques like implied Voc extraction from PL images, Implied current voltage profiling using QSSPC measurement data (Minority carrier lifetime), broken finger identification in cell (Using EL imaging), and Electro-Capacitive voltage profiling was employed in the project to collect measurement data for different solar cell architectures and precursors.
- Machine learning models were developed in scikit-learn for optimizing individual cell fabrication process using simulation data from REST API's and experimental/measured data as training database.
- Funded as core project by SERIS, NUS

Automated Solar cell data Logging and Processing Jun 2016 – Dec 2016
Solar Energy Research Institute of Singapore

- Developed an IOT device (Based on Raspberry Pi) for automated sensing of measurement data on fabrication & characterization tools and upload to a central database. Funded by SERIS, NUS

PhD:

Solar cell optimization using simulation and data science May 2020 – Present
University of New Mexico

- A n-PERT cell simulation model was designed in Sentaurus
- A nonlinear regression model was trained using the simulation data using scikit-learn to mimic the results of Sentaurus simulation.
- Current work is focused on generation of big data (Using the trained Machine learning model), which will be fed to a neural network classifier model for clustering (Segregation of fabrication recipes). Other cell architectures will be future target.

Academic:

Fabrication of N- Channel Enhancement type MOSFET Sep 2019 – Dec 2019
CHTM, Albuquerque

- NMOS devices were fabricated for an academic project on a 525-um thick p type wafer
- The processing steps involved in fabrication were oxidation, photolithography, diffusion, etching and metallization.
- Device was characterized at each step and fabricated device has ideal I-V property.

Remotely programmable smart thermostat Jun 2020 – July 2020
University of New Mexico (ECE 531)

- Linux executable code was developed and deployed on a buildroot based Linux image, monitoring, and reporting temperature collected via a thermostat to an AWS EC2 instance.
- Thermostat status was reported via HTTP Post method, and GET requests were used for remote config.

IV characterization of hetero-junction using TCAD SILVACO Oct 2014 – Dec 2014
Birla Inst. of Tech & Science Pilani (MEL G611)

- A conventional silicon MOS process was used, including dry thermal oxidation and high temperature source-drain annealing
- Technology computer-aided design (TCAD) is used to determine that the bulk low field mobility of the strained silicon which forms the channel

CONFERENCE ATTENDED / CONTRIBUTED

Wolfram Technology Conference 2018 - Oral, First Author [Link to presentation video](#)

Champaign, IL 16 Oct 2018

Online Photovoltaic simulation platform using web-Mathematica

27th Photovoltaic Science & Engineering Conference (PVSEC) 2017 – Oral

Otsu Japan 16 Nov 2017

Xsolar-Hetero: Current Status of the Web-Based solar cell simulation platform developed at SERIS.