

Donald Intal

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EDUCATION AND TRAINING

2021 – Present	Ph.D. in Electrical Engineering <i>Thesis: Characterization of Cu/Si Microstructures</i> <i>Advisor: Prof. Abasifreke Ebong</i>	UNC Charlotte Charlotte, NC, USA
2024	Masters in Electrical Engineering	UNC Charlotte Charlotte, NC, USA
2021	B.S. in Electrical Engineering	UNC Charlotte Charlotte, NC, USA

RESEARCH EXPERIENCE

Photovoltaics Research Laboratory

Advised by Prof. Abasifreke Ebong at UNC Charlotte

Charlotte, NC, USA
August 2021 – Present

- Characterize **metal/Si interfaces** in crystalline silicon solar cells, focusing on **Ag and Cu metallization** in **PERC, PERL, and TOPCon** architectures.
- Investigate **interfacial microstructure, composition, and local electrical behavior** to understand contact formation and performance.
- Perform advanced materials characterization using **SEM, TEM, conductive AFM, SIMS, and FIB**.
- Prepare **site-specific cross sections and TEM lamellae** using **FIB** for nanoscale analysis of buried interfaces and localized defects.
- Analyze **contact morphology, interfacial layers, and defect formation** to evaluate metallization quality and interface integrity.
- Use **SIMS depth profiling** to study elemental distribution and metal diffusion across the silicon interface.
- Use **conductive AFM** to probe nanoscale current transport and local variations in conductivity at contact regions.
- Investigate mechanisms related to **contact degradation, interface instability, and reliability** in metallized silicon devices.
- Work on **LECO (Laser Enhanced Contact Optimization)** to improve contact formation and metallization performance in silicon solar cells.
- Correlate **structural, chemical, and electrical characterization** results to support **metallization process optimization and interface engineering**.

PROFESSIONAL EXPERIENCE AND SERVICE

Scale AI - Human Frontier Collective Specialist – GenAI

LLM Fine-Tuning Specialist for Scientific Accuracy

Internship
April 2025 – Present

- Developed and evaluated challenging domain-specific scientific problem sets to rigorously test LLMs for correctness in materials science and engineering.
- Provided expert, high-accuracy reference answers and structured feedback used in fine-tuning and reinforcement workflows, reviewed and validated peer contributions for consistency and scientific alignment.

Global 3rd Annual LLM Hackathon for Application in Materials Science and Chemistry at NC State University site

Raleigh, NC, USA
September 11th-12th 2025

- Organized and hosted the NC State Site with ~40 participants as a part of a global event 3rd Annual LLM Hackathon for Applications in Materials Science and Chemistry, engaging 1300+ attendees overall.
- Collaborated with a team of five during a 2-day hackathon to design MINT (Molecular Insights Toolkit), a lightweight web platform integrating large language models for MD data analysis.
- Developed features to verify simulation convergence, dynamically recommend analyses based on user queries, and automatically generate context-driven plots and summaries.
- Currently extending MINT to support trajectory uploads from GROMACS, AMBER, LAMMPS, and other MD packages, and implementing a natural language chat interface for detailed analyses (RDF, RMSD, RMSF, cluster analysis) with experimental/benchmark validation.

Journal Peer Review

- Peer reviewer for the *Frontiers in Energy Research*, (3 manuscripts) 2021-Present

Member of Professional Organizations & Certification

- IEEE-HKN (ETA KAPPA NU) 2025- Present
- Fundamentals of Engineering (FE), Electrical & Computer, NCEES Jan 2022

MENTORSHIP AND TEACHING EXPERIENCES

Mentored undergraduate students

1. **Jordan Cook** (EE, UNC Charlotte): Mentored in the design, testing, and implementation of the electrical subsystems for a senior design project, with emphasis on circuit development, instrumentation, and experimental validation. (Aug. – Dec 2025)
2. **Danil Phrakousonh** (EE, UNC Charlotte): Guided in the development of the project's electrical architecture, including hardware integration, measurement setup, troubleshooting, and system performance evaluation. (Aug. – Dec 2025)
3. **Fredie Vasquez-Rios** (CE, UNC Charlotte): Mentored in the computing and control aspects of the project, including software development, system integration, data handling, and interface support for the overall prototype. (Aug. – Dec 2025)

Teaching

- Graduate TA for Intro Electromagnetic Fields (ECGR 3121) Aug 2021 – Present
- Graduate TA for Electromagnetic Waves (ECGR 3122) Aug 2021 – Present
- Graduate TA for Fund. of Electronics and Semiconductors (ECGR 3131) Aug 2021 – Present
- Graduate TA for Electronics (ECGR 3132) Aug 2021 – Present
- Private math tutor in Raleigh, NC, USA. Taught basic calculus and geometry to high-school and basic algebra to elementary school students. 2016 – 2018

RESEARCH PUBLICATIONS

* Peer-reviewed articles [P] = published, [U] = under review [I] = in preparation | others i.e., [C] = conference papers

- [10] Donald Intal, Abasifreke Ebong, Physics-Informed AI for Laser-Enhanced Contact Optimization in Silicon PV: Electrothermal Activation, Degradation Regimes, and Process Control (2026). [In the final stages of preparation of submissions]
- [9] Donald Intal, Sandra Huneycutt, Abasifreke Ebong, Investigation of Airflow Effect on Cu Metallization (2026). [In the final stages of preparation of submissions]
- [8] Intal, D. and Ebong, A.U., 2026. Thin-film solar photovoltaics: Trends and future directions. *Renewable and Sustainable Energy Reviews*, 226, p.116464. <https://doi.org/10.1016/j.rser.2025.116464> [P]
- [7] Intal, D., Phrakousonh, D., Cook, J., Vasquez-Rios, F., Bousaba, N. and Ebong, A., 2025, March. Automated Contact Resistance Measurement for Solar Devices. In *SoutheastCon 2025* (pp. 935-939). IEEE. <https://doi.org/10.1109/SoutheastCon56624.2025.10971520> [C]
- [6] Bayard, C. J., Fedai, M., Joshi, N., Biberić, L., Verma, R., & Intal, D. "MINT LLM: Nature Language Interface for Automated Molecular Dynamics Analysis." In *From Knowledge to Action: Outcomes of the 2025 Large Language Model (LLM) Hackathon for Applications in Materials Science and Chemistry*, pp. 32–33. [11/15/2025][C]
- [5] Intal, D., Ebong, A., Hankey, D. and Tibbetts, M., 2024. Cavitated Ag paste for cost-effective solar cells. *AIP Advances*, 14(8). <https://doi.org/10.1063/5.0223202> [P]

- [4] Huneycutt, S., Ebong, A., Intal, D., Chavez, A., Jeffries, A. and Han, S.M., 2024, June. The Investigation of the Addition of Surface-engineered Carbon Nanotubes to Ag Thick Film Paste to Improve the Solar Cell Front Gridline Durability. In *2024 IEEE 52nd Photovoltaic Specialist Conference (PVSC)* (pp. 1496-1498). IEEE. <https://doi.org/10.1109/PVSC57443.2024.10749220> [C]
- [3] Ebong, A., Intal, D., Huneycutt, S., Druffel, T., Dharmadasa, R., Elmer, K. and Nambo, A., 2024. Screen printable copper pastes for silicon solar cells. *Solar Energy Materials and Solar Cells*, 265, p.112633. <https://doi.org/10.1016/j.solmat.2023.112633> [P]
- [2] Ebong, A., Intal, D., Huneycutt, S., Imhof, H., Stephenson, R., Hankey, D. and Tibbets, M., 2023, December. The Prospect of Cost Reduction in the Metallization of Crystalline Silicon Solar Cells by Alternative Metal Contacts-Ag Coated Cu Paste. In *2023 IEEE 20th International Conference on Smart Communities: Improving Quality of Life using AI, Robotics and IoT (HONET)* (pp. 101-104). IEEE. <https://doi.org/10.1109/HONET59747.2023.10375015> [C]
- [1] Huneycutt, S., Intal, D., Ebong, A., Hankey, D. and Tibbets, M., 2022, December. Cavitated Ag Paste for Next Generation Solar Cells. In *2022 IEEE 19th International Conference on Smart Communities: Improving Quality of Life Using ICT, IoT and AI (HONET)* (pp. 231-234). IEEE. <https://doi.org/10.1109/HONET56683.2022.10018966> [C]

LANGUAGES

- English: Fluent in verbal and written communication
- Vietnamese: Intermediated in verbal and beginner written communication