RÉSUMÉ

Michael A. Boateng

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EDUCATION AND QUALIFICATIONS

School of Engineering, Georgia Institute of Technology, Atlanta, GA *Aug 2023 – Jun 2028*
Doctor of Philosophy (Ph.D.), Electrical and Computer Engineering. CGPA: 3.83/4.0
- Graduate Research Assistant – AI Institute for Advances in Optimization (AI4OPT) | Energy Division
- **Georgia Tech Supervisors:** Prof. Pascal Van Hentenryck and Prof. Daniel Molzahn
- **External Industry and Academic Mentors:** Dr. Russell Bent (LANL) and Prof. Parikshit Pareek (IIT Roorkee)

School of Engineering, Georgia Institute of Technology, Atlanta, GA *Aug 2023 – May 2025*
Master of Science (MS.), Electrical and Computer Engineering. CGPA: 3.80/4.0
- Minor: Industrial and Systems Engineering (ISyE) – *Regression Analysis,* ***Convex Optimization & Machine Learning***
- Coursework: ***Power Systems*** *(Protection, Cybersecurity, Operation & Control),* ***Statistical Methods****, Linear Systems & Control*

Engineering Department, Ashesi University, Accra, Ghana *Sep 2018 – Jun 2022*
Bachelor of Science (B.Sc.), Electrical and Electronics Engineering. Cum Laude
- B.Sc. Project: Overall Best Thesis – Engineering Department [Published in IEEE Xplore| Citations: 20+]

RESEARCH EXPERIENCE

Graduate Research Consultant*,* Austin, TX *Oct 2025 – Present*
Electric Reliability Council of Texas (ERCOT), *Risk Assessment of Texas Grid Using AC SCOPF*
- Collaborating with ERCOT engineers on machine learning approaches for Security-Constrained AC Optimal Power Flow (AC SCOPF) and greater than N-3 contingency analysis, using real-world operational data from the Texas grid
- Developing a self-supervised primal-dual learning neural-network that incorporates AC non-linearities into preventive SCOPF pipelines, with the goal of enhancing grid reliability under large-scale system conditions (1000+ buses)

Graduate Research Intern, Los Alamos, NM *May 2025 – Present*
Los Alamos National Laboratory (LANL), *End-to-End Learning for AC Feasibility Restoration in DCOPF*
- Designing an LMP-preserving DCOPF-ACPF pipeline that learns DCOPF parameters and generator participation factors, and computes pseudo-LMPs from AC-PF Jacobian sensitivities to keep AC prices aligned with DC outcomes
- Implementing implicit-function gradients—KKT adjoints for DC-OPF and a single transpose-Jacobian solve for AC-PF —to enable end-to-end training in Python with NumPy/SciPy, PyTorch, CVXPY, and OSQP/GUROBI
- Prototyping fast feasibility restoration with smooth voltage-reactive power handling, while exploring tap/shunt policies to cut recalculations and runtime on large test cases by 90%, compared to conventional approaches

Graduate Research Intern, Los Alamos, NM *Sept 2024 – Aug 2025*
Los Alamos National Laboratory (LANL), *Exploring DCOPF and ACPF Formulations for AC Feasibility*
- Engineered a unified DCOPF→ACPF recovery pipeline combining four loss-aware DC models with AC feasibility restoration techniques including distributed slack allocation, PV/PQ bus switching, and voltage-informed initialization
- Evaluated the pipeline on 10,000+ stochastic dispatch scenarios across large-scale power systems, demonstrating feasibility restoration in the major cases and reducing inequality constraint violations by 3–5× under extreme loading
- Reduced Newton-Raphson convergence iterations by ~50% in stressed test cases and eliminated active/reactive power violations across challenging industry-grade networks, including PEGASE and RTE benchmark systems
- Achieved 75% lower mean absolute error and 93% cost difference reduction compared to traditional single-slack methods, showing the effectiveness of incorporating line losses and distributed control in DCOPF formulations

Graduate Research Assistant, Atlanta, GA *Apr 2025 – Oct 2025*
AI Institute for Advances in Optimization (AI4OPT), *Volt-VAR Optimization for Large-Scale Power Systems*
- Designed a transmission-scale Volt/VAR Optimization framework that co-optimizes OLTC tap ratios and capacitor-bank modules under AC power-flow physics, implementing a relax–round–resolve pipeline, that encodes device limits
- Formulated operations-aligned objectives that hold voltage and VAR setpoints while penalizing active-power redispatch and preserving economic dispatch, integrating ACOPF/market references for AC-feasible setpoints
- Performed an extensive review of transmission-scale Volt/VAR and discrete ACOPF (MINLP, relax–round–resolve, cutting-plane/OA, homotopy, metaheuristics, interior-point); pinpointing gaps in *(i)* scalable AC-feasible tap/shunt schedules, *(ii)* realistic device step modeling, and *(iii)* coordination with market dispatch and loss/price sensitivities

Graduate Research Assistant, Atlanta, GA *Dec 2024 – Present*
Georgia Institute of Technology (Georgia Tech), *Dynamic State Estimation in Current Transformer Merging Units*

- Trained and evaluated four regression models—Multiple Linear, Ridge, Lasso, and Elastic Net—on over 52,000 observations, using an 80/20 train-test split and environmental predictors like temperature, humidity, and wind speed
- Applied statistical preprocessing techniques (normalization, standardization, and correlation filtering), revealing strong intra-zone correlations (e.g., Zone 1 to overall demand: $\rho = 0.959$) and weak relevance of wind speed and diffuse flows
- Achieved best generalization with Lasso Regression, reducing Mean Absolute Error to 134.79 and avoiding overfitting observed in MLR (MAE = 3.04) by balancing model complexity with predictive accuracy, stability, and robustness

Graduate Research and Teaching Assistant, Atlanta, GA *Oct 2024 – Present*
Georgia Institute of Technology (Georgia Tech), *Design Fundamentals (ECE 3011), Digital Design Lab (ECE 2031*)

- Introduced faculty and students to Electronic Design Automation (EDA) as an alternative to Eagle and Altium, and created a full set of lectures and video guides to support final-project Printed Circuit Board (PCB) design
- Leading the development of MPower Boards (MPBs), integrating 3-D printing, LED technology, and real-time simulations to create a physical, interactive model of power grids for enhanced educational and research
- Advancing commercialization with Georgia Tech's Create-X program by building a portable, battery-powered device, scoping IP for a provisional patent, and piloting IEEE-14/30/39 classroom demos, to visualize grid line faults

SKILLS

- **Languages:** English (Native), Sign Language, C++, MATLAB, PHP, MySQL, HTML, CSS, R, Python, and Julia
- **Tools:** PowerModels, MATPOWER, PG-LIB, Pandapower, PowerWorld, PyPSA, SciPy, CVXPY, PyTorch, Git

HONORS AND AWARDS

Los Alamos National Lab's 'Distinguished Student Performance Award' 2026 (1 of 8 across lab) NM, USA *Aug 2026*
Argonne National Lab's Training Program on Extreme-Scale Computing (1 of 75 Nationwide), IL, USA *Jul 2026*
Create-X Entrepreneurship Program with $5000 Seed Funding for Power Systems Education, GA USA *Feb 2026*
GT's Up with the White and Gold 'Rising Star Award': Center for Student Engagement, GA USA *Apr 2026*
Center for Nonlinear Studies Grid Science Winter School & Conference: Travel Grant Winner, NM, USA *Jan 2025*
Argonne Department of Energy's CyberForce® Competition: Travel Grant Winner, IL, USA *Nov 2024*
International Solid-State Circuits Conference: Travel Grant Winner (1 of 4, 1st Year ECE PhDs), CA USA *Jan 2024*
Silver Medalist: Poster Presentation, International Genetically Engineered Machine *(Competition),* France *Oct 2022*

RECENT JOURNAL/ CONFERENCE PUBLICATIONS

- **M.A. Boateng,** R. Bent, S. Misra, P. Pareek, P. Van Hentenryck, and D. Molzahn, "PACR: Parameter-Optimized AC Power Flow Restoration for AC Feasible DCOPF Dispatch," ArXiV available. June 30, 2026.
- **M.A. Boateng,** R. Bent, S. Misra, P. Pareek, P. Van Hentenryck, and D. Molzahn, "Towards AC Feasibility of DCOPF Dispatch," Electric Power Systems Research, 2027. Presented at the 24th Power Systems Computation Conference (PSCC), June 8–12, 2026 | [Acceptance rate: **34.6%** in 2026].
- S. Tong, **M.A. Boateng,** M. Tanneau, and P. Van Hentenryck, "Volt/VAR Optimization in Transmission Networks with Discrete-Control Devices," Electric Power Systems Research, 2027. Presented at the 24th Power Systems Computation Conference (PSCC), June 8–12, 2026 | [Acceptance rate: **34.6%** in 2026].
- **M.A. Boateng,** G. Gauderman, and N. Uwamahoro, "Physics-Informed Dynamic State Estimation for Current Transformers Using Graph Neural Networks," in Proceedings of the Fault and Disturbance Analysis Conference (FDAC), Apr. 13–14, 2026.
- R. Asiamah, S. Talkington, **M. Boateng**, M. Vanin, F. Geth, and D. Molzahn, "Classifying Reactive Power Control Laws of Behind-the-Meter Solar Photovoltaic Inverters," Proc. IEEE Kansas Power and Energy Conf. (KPEC), 2025.

REVIEWED CONFERENCE/ JOURNAL PAPERS

- 2026 *International* ***Journal*** *of Applied Power Engineering* (*IJAPE*). Track: Distributed Systems
- 2026 *Electric Power Systems Research* ***Journal*** (Elsevier, Impact Factor: 4.2; CiteScore: 8.2). Track: Neural Networks (x5)
- 2025 IEEE *Kansas Power and Energy* ***Conference*** *(KPEC),* Track: Solar Power, Transmission Systems (x2)

LEADERSHIP AND COMMUNITY INVOLVEMENT

Chief of Staff: Georgia Tech Graduate Student Government Association, GA, USA *May 2026 – Present*
Secretary: Institute of Electrical and Electronics Engineers, GT Chapter, GA, USA *May 2026 – Present*
STEM Volunteer: Building Laser Harps with Electronics, Santa Fe Community College, NM, USA *Jul 2026*
STEM Volunteer: Designing Guitars with Electronics, Northern NM College, Española, NM, USA *Jul 2026*
Volunteer Presenter: AI for Energy Outreach for Denmark High School Students, GA, USA *Mar 2026*