Blaine Costello

Computational Nanomaterials | Algorithm Development

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Education

Georgia Institute of Technolgy — *Atlanta, GA*

Ph.D. in Electrical Engineering (GPA: 3.54) — *2019 - 2021*

M.S. in Electrical Engineering (GPA: 3.54) — *2016 - 2019*

B.S. in Computer Engineering (GPA: 3.57) — *2013 - 2016*

Research

Graduate Research Assistant: Institute for Electronics and Nanotechnology (IEN) — *Atlanta, GA*

Georgia Institute of Technology - Department of Electrical & Computer Engineering — *Aug 2016 - Present*

- Designed, fabricated, and tested experimental nanocapacitors to study the impact of highly-polarizable material interfaces on the energy storage properties of nanolaminates [4].
- Developed and validated a custom simulator of electric fields in composite materials to study how the stochastic internal microstructure of nanoparticle composite materials impacts the limits and variations of energy density [3].
- Implemented a physics-based model to better predict the dielectric breakdown of simulated composites [2].
- Updated model for quasistatic electric field approximation to quantify the frequency dependence, energy density, and loss characteristics of simulated metal-insulator nanoparticle composites [1].

Undergraduate Research Assistant: Intelligent Robotics & Emergent Automation Lab (IREAL) — *Atlanta, GA*

Georgia Institute of Technology - Department of Mechanical Engineering — *Jan 2015 - Aug 2016*

- Successfully designed, built, programmed, and tested a cooperative system of ground robots for planar payload manipulation [4].
- Designed prototype of a wire-traversing robot for a low-cost, low-power autonomous agricultural monitoring platform.

Research Engineer: Autonomous Airdrop & Landing Systems — *Atlanta, GA*

Earthly Dynamics Corporation - Research & Development — *May 2011 - Jan 2015*

- Maintained prototyping lab equipment and produced user manual that was used in lab training for new employees.
- Fabricated and tested prototype of novel robotic landing gear system.
- Aided in design and experimental measurement of aerodynamic parameters for novel humanitarian aid airdrop system [6].

Projects

Decentralized Anonymous Peer-Review Ecosystem: Python, Solidity — *2021*

- Designed smart contracts for a decentralized service that maintains accountability through credential verification and recursion.
- Devised generalized incentive protocols to motivate adoption, engagement, and content creation.
- Created detailed outline of usage and logical flow for all categories of users.
- ***Implementation in Progress...***

Autonomous Cryptocurrency Trading Bot: Python [tkinter, pandas, cbpro] — *2019*

- Implemented a functional autonomous cryptocurrency trading bot in python that is capable of employing a variety of custom trading strategies.
- Built functional GUI front-end to visualize monitor outputs and to update bot parameters from a remote device.
- Deployed and monitored the bot remotely on a custom-built Linux server.
- Implemented cloud architecture for scalable, account-based distribution.

Proficiencies: Python, Matlab, Solidity, C/C++, Java, Unix terminal, Bash, CUDA, MOAB, Golang, Git, Data structures, Algorithm design.

Teaching

Cohort Leader: Grand Challenges Scholars Program — *Atlanta, GA*

Georgia Institute of Technology — *Fall 2021 - Present*

- Organized and led cohort of undergraduates through weekly activities and lectures towards exploring their own individual problem spaces.
- Mentored students individually and in groups to facilitate collaboration and guided them through the problem discovery phase to identify root causes and solvable problems in the following areas: (1) urban infrastructure and planning, (2) racial discrimination and inequity, and (3) energy insecurity.

Professional Tutor — *Atlanta, GA*

Self-Employed — *2018 - 2021*

- Tutored high school and college students in calculus, algebra, statistics, discrete math, various programming languages, chemistry, physics, technical writing, computer aided design, and a variety of other topics.
- Organized individual lessons for struggling high school and college students to brush up on foundational skills.
- Tracked student progress and administered short assignments to identify strengths and weaknesses in each session.

Team Facilitator: Grand Challenges Living and Learning Community *Atlanta, GA*

Georgia Institute of Technology *2016 - 2018*

- Advised teams of undergraduates through high-impact technical projects including (1) Hydrogauge: developing a low-cost water quality testing to quickly identify communities impacted by industrial water contamination, and (2) Never Tapped Out: optimizing septic systems for rural areas with high density clay soil to limit runoff.
- Attended team dynamics and leadership workshops focused on providing mentorship to both individuals and teams.

Publications

[1] B. Costello and J. A. Davis, "Energy Storage Limits and Variations in Metal-Insulator Nanocomposites Negative Filler Conductivity and Exotic Interphase Properties," <In-Progress>, 2021.

[2] B. Costello and J. A. Davis, "Breakdown Field Strength Variations and Energy Density Limits of Nanoparticle Composite Materials," *IEEE Transactions on Nanotechnology*, vol. 19, pp. 811-819, 2020.

[3] B. Costello, J.A. Davis. "Quasi-Electrostatic Simulation of Energy Density Limits and Variability in Nanoparticle (NP) Composite Materials," *TechConnect World Innovation Conference & Expo*, Boston, Massachusetts, 2019.

[4] Z.M. Karimi, D. Brown, E. Woods, B. Costello, W. Henderson, J. Davis. "Characterization and Simulation of Permittivity Enhancements of Si O2/Si_3N_4 Nanolaminate Layers," *IEEE Nanotechnology Materials and Devices Conference*, Portland, Oregon, 2018.

[5] B. Costello, E. Davies, L. Strickland, J. Rogers. "A Novel Distributed Ground Robotic System for Cooperative Manipulation of Payloads of Any Size," CASE 2016, *IEEE International Conference on Automation Science and Engineering*, Fort Worth, Texas, 2016.

[6] T. Herrmann, M. Costello, C. Montalvo, B. Costello, "Design, Simulation, and Experimental Testing of Humanitarian Aid Airdrop Micro Packages," *AIAA Atmospheric Flight Mechanics Conference*, Minneapolis, Minnesota, 2012.

References

Dr. Jeffrey A. Davis, Associate Professor of Electrical and Computer Engineering *Jeff.Davis@ece.gatech.edu*
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