

VINEET JAGADEESAN NAIR

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EDUCATION

Massachusetts Institute of Technology | PhD in Computational Science and Engineering | **GPA: 5.0/5.0** Jan 2021 - May 2025 (*expected*)
PhD Candidate in the Mechanical Engineering department

Massachusetts Institute of Technology | SM in Computational Science and Engineering | **GPA: 5.0/5.0** Sep 2019 - Jan 2021
Thesis: Estimating cumulative prospect theoretic passenger behavioral models for dynamic pricing & transactive control of shared mobility

University of Cambridge | MPhil in Energy Technologies | 1st Class Honors | Gates Cambridge Scholar Sep 2018 - Sep 2019
Thesis: Optimal design & energy management of islanded, hybrid microgrids for off-grid communities with no external power exchange

University of California, Berkeley | **Cumulative GPA: 3.842/4.0** | Dean's Honors List | Phi Beta Kappa Aug 2014 - May 2018
B.S. Mechanical Engineering Honors, B.A. Economics | Distinction | Cal Alumni Association Leadership Award | Tau Beta Pi
Minor in Electrical Engineering & Computer Sciences | Certifications in Human-Centered Design and Entrepreneurship & Technology

SKILLS

Technical Skills: Python, Julia, MATLAB/Simulink, Java, JAX, R, Fortran, Git, Bash, Shell, STATA, Data science & visualization, High performance computing, Machine learning frameworks, SolidWorks, AutoCAD, Fusion 360, LaTeX, LabVIEW, Finite element analysis,
Languages: English, Hindi, Malayalam, Sanskrit, German (intermediate), Spanish (basic), French (basic)

RESEARCH EXPERIENCE

- Graduate Research Assistant** | Active Adaptive Control Lab, MIT Mechanical Engineering Department Sep 2019 - *present*
- Apply distributed optimization, game theory, and control systems tools to model power grids and distributed energy resources (DERs)
 - Design new local market structures and algorithms to better coordinate and compensate DERs and prosumers in distribution networks
 - Model dynamic pricing for shared, mobility-on-demand services using cumulative prospect theory, supervised by Dr. Anuradha Annaswamy
 - Work with external partners including Ford, Siemens, GE, PNNL, NREL, Dept. of Energy and Princeton University
- Computational Scientist PhD Resident** | [Google] X, the moonshot factory, Mountain View, CA May - Dec 2023
- Developed faster solvers and simulators; applying physics-informed machine learning to study power system dynamics at Project Tapestry
 - Applied stochastic & multiperiod optimization methods to study impacts on renewables variability on the value of battery storage
- Graduate Research Intern** | National Renewable Energy Laboratory (NREL), Golden, CO May - Aug 2022
- System modeling and digital real-time simulation for hardware-in-the-loop validation of optimization/control algorithms in power grids
- Research Intern, Artificial Intelligence/Deep Learning for Smart Grids** | Siemens, Princeton, NJ May - Sep 2020
- Developed a bilevel optimization framework and market mechanism for grid integration of DERs along with demand response
- Graduate Student Researcher** | Control Group, Cambridge University Engineering Department Nov 2018 - Aug 2019
- Researched the optimal design, energy management, dispatch, and control of hybrid, islanded microgrids, supervised by Dr. Ioannis Lestas
- Mechanical and Process Engineering Intern** | Applied Materials, Santa Clara, CA May - Aug 2017
- Developed a more accurate, real-time and cost-effective method for monitoring levels of solid chemicals inside process chambers
 - Drafted 3D models, detail drawings, collaborated with suppliers to implement alternative sensors and measurement techniques
- Honors Undergraduate Researcher** | Energy and Resources Group (Prof. Duncan Callaway), UC Berkeley Jan 2017- May 2018
- Designed and prototyped low-cost energy monitors, scaled up to produce 80+ units for field trials in Nicaragua via laser cutting
 - Researched user incentives, programmed sensor networks to optimize electricity use and improve behavioral energy efficiency
- Cal Energy Corps Research Intern** | Academia Sinica, Taipei, Taiwan | Berkeley Energy & Climate Institute Jun - Aug 2016
- Optimized organic, low-cost dye-sensitized solar PV cells to raise efficiency from 8 to 9%, improved stability through co-sensitization
- Undergraduate Research Apprentice** | Indoor Air Lab, Civil and Environmental Engineering, UC Berkeley Jan - Jun 2016
- Investigated and modeled temperature effects on airflow patterns and mixing times of gaseous pollutants, under Prof. William Nazaroff
 - Independently designed and completed pilot experiment studying ultrafine particle emissions from dust and hot surfaces

PROFESSIONAL EXPERIENCE

Artificial Intelligence (AI) Fellow | MIT-Pillar AI Collective

Jan 2024 - present

- Customer discovery to explore commercial applications of my research in timeseries forecasting & physics-informed ML for power systems
- Participating in the National Science Foundation (NSF) Innovation Corps (I-Corps) program at MIT

MIT Delegate & UNFCCC Observer | COP28, Dubai, United Arab Emirates

Oct - Dec 2023

- Represented MIT and observed international negotiations at the 2023 United Nations Climate Change Conference of the Parties

Technical Curriculum Developer & Lead Instructor | MIT International Science & Technology Initiatives

Nov 2023 - Jan 2024

- Developed curriculum for, and taught course on renewable energy and climate change for high school students in South Africa & Botswana

Data Science & Machine Learning Instructor | MIT International Science & Technology Initiatives, Montevideo, Uruguay

Jan 2023

- Organized 3-week machine learning & entrepreneurship course at Universidad Tecnológica del Uruguay as part of MIT Global Startup Labs
- Developed & taught interactive lessons on neural networks, advanced deep learning methods, model validation, and hyperparameter tuning
- Mentored teams of students and professionals working on diverse applied ML startups and research projects

Research Consultant for Innovation Challenge | Avangrid, Orange, CT

May - Oct 2021

- Worked with Avangrid's Smart Grids Innovation team to implement a distributed energy resources management system (DERMS) pilot
- Developed a hybrid/federated software architecture and decision-making method for DERMS, to enhance cybersecurity & interoperability

Thriving Earth Exchange Community Science Fellow | American Geophysical Union (AGU)

Jan 2021 - Nov 2023

- Part of 2021 cohort, in partnership with American Meteorological Society (AMS) and Association of Science & Technology Centers (ASTC)
- Worked with scientists, community leaders, legislators, gas & power utility representatives, environmental advocates, and local citizens
- GIS data collection, infrastructure planning, and environmental impact assessment to build an energy plan for Otsego County, New York

Entrepreneurship Project Director | Cambridge Development Initiative and Kite Dar es Salaam

Oct 2018 - Sep 2019

- Designed and implemented projects to boost youth technology entrepreneurship, improve sanitation and clean energy access in Tanzania

Ruhr Fellow | University Alliance Ruhr and TU Dortmund, Germany

Jun - Aug 2018

- One of only 12 undergraduates selected from across the US to participate in a 2-month transatlantic summer exchange program

Energy Management Intern at DEW21 (Energy & Water Authority) | Dortmund, Germany

Jul - Aug 2018

- Modeled and optimized hourly/daily price forward curves to predict natural gas prices in European markets, five years into the future

Engineering, Math, Physics and Chemistry Tutor | Center for Access to Engineering Excellence, UC Berkeley

Aug 2016 - May 2018

- Tutored students and peers for 14+ hours a week, both individually and in study groups (3-5 students), and hosted review sessions

Vice President of Operations | Bay Area Environmentally Aware Consulting Network (BEACN)

May 2017 - Jan 2018

- Spearheaded client acquisition, sponsorships and member recruitment, supervised project management, club logistics and finances

Strategic Partnerships Coordinator | ASUC Helios Solar Program, UC Berkeley

Oct 2015 - Aug 2017

- Connected student group housing to low-cost solar PV installations and promoted sustainability through rolling renewable energy fund

Undergraduate Liaison and Vice President of Technology | Berkeley Energy & Resources Collaborative (BERC)

Dec 2015 - May 2018

R&D Engineer and Controls Sub Team Member | Berkeley Hyperloop (bLoop)

Sep 2016 - Aug 2017

- Designed control systems, improved efficiency of propulsion and self-powering components, predicted the pod's socioeconomic impact
- Competed as a finalist in the SpaceX Hyperloop on-track competition in January 2017

Senior Consultant and Project Manager | Bay Area Environmentally Aware Consulting Network (BEACN)

Sep 2015 - May 2017

- Led team of consultants in competitive strategy, market research, studying socioeconomic impact and technical data analysis
- Provided triple bottom line consulting for sustainable firms including a cleantech financier, geothermal startup & agrochemical biotech firm

External Consultant | BERC Innovative Solutions Consulting

Jan 2016 - Jun 2017

- **Electric Power Research Institute:** Identified key drivers and use-cases for production, storage, transport, and use of hydrogen energy
- **Amazon Web Services:** Analyzed technical, financial, and policy aspects regarding renewable energy storage in Amazon's data centers

Residential Sustainability Program Coordinator | Office of Student Development, UC Berkeley

May 2015 - May 2016

- Implemented sustainable projects, organized events in dorms and dining halls to raise environmental awareness among 7000+ residents

Peer Advisor | Department of Economics, UC Berkeley

Jan - Jun 2016

- Advised fellow economics students on areas related to academic planning, research, the honors program, and other opportunities

Undergraduate Student Instructor for General Chemistry | College of Chemistry, UC Berkeley

Jan - Dec 2015

- Assisted graduate students in teaching two discussion sections and helped facilitate two laboratory sessions of 30+ students each

PROJECTS

Selected Programming Projects | UC Berkeley, University of Cambridge, MIT

Jan 2018 - present

- Used natural language processing and deep neural networks for future stock price predictions based on textual news data
- Extended sparse regression techniques to discover partial differential equations and denoised data via dynamic mode decomposition
- Implemented a numerical model in MATLAB to simulate traffic flows on highways and mitigate congestion
- Wrote a finite-element, computational fluid dynamics program from scratch in Fortran to analyze compressible flow through pipes
- Developed finite state machine model based on hybrid systems theory to optimally schedule and coordinate EV charging along highways
- Implemented various Java data structures to build a basic version of Google Maps, an auto grader, and an interactive, 2D game

Selected Controls, Modeling, and Design Projects | UC Berkeley, University of Cambridge, MIT

Aug 2014 - May 2018

- Designed and built an automated, voice-controlled coconut processor as part of my senior year capstone mechatronics project
- Designed and built a voice-controlled, miniature car using Python, Arduino, and proportional control schemes in negative feedback
- Designed feedback control systems for magnetic levitation and a self-erecting inverted pendulum, implemented via MATLAB/Simulink
- Designed and 3D printed a mini-windmill to maximize structural strength and stability, built control system for optimal power output

Tensegrity Lights for Homes and Entertainment | Berkeley Emergent Space Tensegrities Lab and NASA Ames

Jan 2017 - Aug 2017

- Developed applications for flexible, light-weight, autonomous tensegrity robots outside space exploration, based on user feedback
- Designed and prototyped versatile, kinetic lighting structures based on tensegrity with programmable motion and color schemes

Locus: Improved Vision for Autonomous Vehicles | Sutardja Center for Entrepreneurship & Technology

Jan 2017 - Dec 2017

- Created passive RFID road marking & readers to improve lane detection and safety of autonomous cars in low-visibility & bad weather
- Created a working prototype, raised >\$10000 of seed funding and set up partnerships with city governments to develop our new venture

Mobile App Challenge Finalist | Center for Information Technology Research in the Interest of Society (CITRIS)

Jan - May 2016

- Designed and built a prototype for an app providing short-term 'micro tasks' and online volunteering opportunities to users

Predicting Academic Performance | Term Project for the Econometric Analysis class, UC Berkeley

Mar - May 2016

- Developed and evaluated a multiple linear regression model to accurately predict students' Math test scores, using STATA and Excel

Engineering Design team member & Robotics Mentor | Pioneers in Engineering (PiE), UC Berkeley

Jan 2015 - May 2016

- Helped design, fabricate and code a computer numerical control mill, mentored high school teams, and developed robot kits

LEADERSHIP, TEAMWORK & ACTIVITIES

Climate Reality Leadership Corps Member

Apr 2024 - present

Impact Officer & Project Lead | Global Shapers, World Economic Forum

Sep 2023 - present

Graduate Student Representative | MIT Corporation Joint Advisory Committee on Institute-Wide Affairs

Aug 2022 - Aug 2023

Co-President | MIT Energy & Climate Club

Apr 2022 - May 2023

Content & Operations Team Member | MIT Global Startup Workshop (GSW)

Oct 2021 - Mar 2023

Technical Research Seminar Organizer | MIT International Science & Technology Initiatives (MISTI)

Sep - Nov 2022

Elite Summer School in Robotics, Automation & Entrepreneurship | Innovation Centre Denmark

Aug 2022

Co-Managing Director | 2022 MIT Energy Conference

May 2021 - Apr 2022

Vice President of Community & Education | MIT Energy & Climate Club

May 2020 - May 2021

Co-Director of Applicant Experience | 2021 Climate & Energy Prize (CEP) @ MIT

Sep 2020 - April 2021

Young Professionals Affinity Group Team Lead | Clean Energy for Biden (CE4B)

Jun - Nov 2020

2020 MIT Energy Conference Showcase Co-Director | MIT Energy Club

Sep 2019 - Apr 2020

Graduate Student Leadership Incubator Fellow | MIT 2019-20 Cohort

Sep 2019 - Sep 2020

Engage for Change Fellow | Cambridge Hub and University of Cambridge Environment & Energy Team

Jan - April 2019

Undergraduate Student Representative At-Large | The Green Initiative Fund, UC Berkeley

Aug 2017 - May 2018

Industrial & Public Relations Officer | Tau Beta Pi National Engineering Honor Society, CA-A Chapter

Jan 2016 - May 2018

Professional Development & Outreach Officer | Pi Tau Sigma Mechanical Engineering Honor Society

Sep 2016 - May 2018

LeaderShape Institute Graduate | Leadership Development Program, UC Berkeley College of Engineering

Jan 2016

UCB Solar Spring Break Team Member | GRID Alternatives, Oakland, CA

Oct 2015 - May 2016

Alternative Spring Break Volunteer | United Way, Biloxi-Gulfport, MS

Mar 2015

HONORS & AWARDS

Conference Travel Grant Award | MIT Graduate Student Council

Mar 2024

MIT-Pillar AI Collective Fellowship | Pillar VC & MIT Deshpande Center for Technological Innovation

Dec 2023

Den Hartog Travel Award in Mechanics | MIT Mechanical Engineering Department

Jan 2023

Out in STEM (oSTEM) Scholarship | Berkshire Hathaway Energy Foundation

Oct 2022

Best Paper Award: 3rd Place | 54th North American Power Symposium

Oct 2022

MIT MADMEC Sustainability Challenge: 2nd Place | MIT Materials Science & Engineering Department

Oct 2022

Martin Family Society Fellowship for Sustainability MIT Environmental Solutions Initiative	Mar 2022
Runner up MIT Entrepreneurship & Maker Skills Integrator (MEMSI) Hardware Startup Bootcamp	Jan 2022
Best Business Plan at International Clean Energy Challenge 2019 Upper Austria	Jul 2019
Gates Cambridge Scholarship University of Cambridge and Bill & Melinda Gates Foundation	Mar 2018
Dean's Honors List College of Engineering and College of Letters & Science, UC Berkeley	Fall 2014 - Spring 2018
Phi Beta Kappa National Honor Society Member	Mar 2018
Ruhr Fellowship University Alliance Ruhr & TU Dortmund, Germany	Apr 2018
43rd Annual Business Today International Conference Impact Challenge Finalist Princeton University	Nov 2017
Robotics Institute Summer Scholars Acceptance (Declined Offer) Carnegie Mellon	May 2017
Smart Cities Innovation Collider Winner Sutardja Center, Pear.VC, Bosch, and City Innovate Foundation	Apr 2017
Dean's Startup Seed Fund Winner Haas School of Business, UC Berkeley	May 2017
Pi Tau Sigma Mechanical Engineering Honor Society Member	Sep 2016
Tau Beta Pi National Engineering Honor Society Member	Feb 2016
Omicron Delta Epsilon Economics Honor Society Member	Feb 2016

PUBLICATIONS

Vineet Jagadeesan Nair, Priyank Srivastava, Venkatesh Venkataraman, Anuradha M. Annaswamy et al. "Efficient Ultra-Resilient IoT-Coordinated Assets for Resilience at the Grid Edge." *Submitted to the Proceedings of the National Academy of Sciences (PNAS)* 2024.

Vineet Jagadeesan Nair, Priyank Srivastava, and Anuradha M. Annaswamy. "Enhancing power grid resilience to cyber-physical attacks using distributed retail electricity markets." *15th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPs)* 2024.

Vineet Jagadeesan Nair, and Anuradha M. Annaswamy. "Local retail electricity markets for voltage control and distribution grid services." *7th IEEE Conference on Control Technology and Applications (CCTA)* 2023).

Vineet Jagadeesan Nair, Venkatesh Venkataraman, Rabab Haider, and Anuradha M. Annaswamy. "Hierarchical Local Retail Electricity Markets for Distributed Energy Resources." *IEEE Power and Energy Society General Meeting (PESGM)* 2023).

Vineet Jagadeesan Nair, Venkatesh Venkataraman, Rabab Haider, and Anuradha M. Annaswamy. "A Hierarchical Local Electricity Market for a DER-rich Grid Edge." *IEEE Transactions on Smart Grid* (2022).

Thomas Lee*, **Vineet Jagadeesan Nair***, and Andy Sun. "Impacts of Dynamic Line Ratings on the ERCOT Transmission System." *54th North American Power Symposium (NAPS)*. *IEEE Xplore* (2022).

Priyank Srivastava, Rabab Haider, **Vineet Jagadeesan Nair**, Venkatesh Venkataraman, Anuradha M. Annaswamy, and Anurag K. Srivastava. "Voltage regulation in distribution grids: A survey." *Annual Reviews in Control* (2023).

Vineet Jagadeesan Nair and Lucas Pereira. "Improving accuracy and convergence of federated learning edge computing methods for generalized DER forecasting applications in power grids." *Poster presentation at Tackling Climate Change with Machine Learning workshop at the 36th Conference on Neural Information Processing Systems (NeurIPS)* (2022).

Vineet Jagadeesan Nair and Anuradha M. Annaswamy. "Local retail electricity markets for grid services in DER-rich distribution systems." *2022 Transactive Energy Theory Workshop, Pacific Northwest National Laboratory (PNNL)*.

Anuradha M. Annaswamy* and **Vineet Jagadeesan Nair***. "Human Behavioral Models Using Utility Theory and Prospect Theory." *In Cyber-Physical-Human Systems: Fundamentals and Applications*, UK: Wiley, in Press (2023).

Vineet Jagadeesan Nair, and Anuradha M. Annaswamy. "Local Hierarchical Electricity Markets for Distribution Grid Services like Voltage Control." *Poster presentation at the NREL Fifth Workshop on Autonomous Energy Systems* (2022).

Vineet Jagadeesan Nair, Venkatesh Venkataraman, Rabab Haider, and Anuradha M. Annaswamy. "Secure And Private Market-based Coordination of Grid Edge IoT Devices." *Invited presentation at INFORM 2021 Annual Meeting: Session on Data Analytics in Cyber-Physical Systems*.

Thomas Lee*, **Vineet Jagadeesan Nair***, and Andy Sun. "Impacts of Dynamic Line Ratings on Security-Constrained Economic Dispatch for Transmission Grids & Wholesale Electricity Markets." *Technical Presentation to Federal Energy Regulatory Commission (FERC)* (2022).

Vineet Jagadeesan Nair, Yue Guan, Anuradha M. Annaswamy, H. Eric Tseng, and Baljeet Singh, "Sensitivity Analysis of Passenger Behavioral Model for Dynamic Pricing of Shared Mobility on Demand." *Communications in Transportation Research* (2022). *Under review*.

Vineet Jagadeesan Nair, Anuradha M. Annaswamy. "Estimation of Cumulative Prospect Theory-based Passenger Behavioral Models for Dynamic Pricing & Transactive Control of Shared Mobility on Demand." Master of Science Thesis in Computational Science & Mechanical Engineering. *Massachusetts Institute of Technology* (2021).

Vineet Jagadeesan Nair, Ioannis Lestas. "Optimal design and energy management of islanded, hybrid microgrids for remote, isolated off-grid communities with no external power exchange." Master of Philosophy Thesis in Energy Technologies. *University of Cambridge* (2019).

Sean Anderson, and **Vineet Jagadeesan Nair**. "Optimal Charge Scheduling of Electric Vehicles." *Preprint* (2018).