

Nivedita Arora
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RESEARCH FOCUS

My research envisions creating **computational materials and things with a sustainability-first approach** throughout their lifecycle - 1. eco-friendly materials/manufacturing, 2. battery-free system operation, and 3. responsible reuse/disposal at the end of the lifecycle. My research process involves working at the intersection of device fabrication, low-power systems, and industrial design. I actively seek to apply my work to application domains such as smart homes, health, accessibility, biodiversity, and urban infrastructure monitoring.

My first realized example of sustainable computational material, **interactive stickers**, has appeared in ACM IMWUT, ACM UIST, ACM MobiSys, and Communications of the ACM. It has won **2 best papers** (ACM IMWUT, ACM SenSys-ENSsys), **2 best poster awards (MobiSys, UIST)** and research highlights in Communications of the ACM and SIGMOBILE GetMobile Magazine. I was named the winner of the **Gaetano Borriello outstanding student** award in the ACM Ubicomp and ISWC community, **Foley scholar** in Georgia Tech's Gvu Center, **Outstanding GRA** in Georgia Tech's College of Computing and MIT rising stars in EECS.

EDUCATION

- Ph.D. Computer Science - Intelligent Systems** Aug. 2016 - Dec 2022
Georgia Institute of Technology, Atlanta
Thesis: *Sustainable Interactive Wireless Stickers: From Materials to Devices to Applications*
Advisor: Gregory D. Abowd, Thad Starner
- M.S. Human-Computer Interaction - Interactive Computing** Aug. 2014 - May 2016
Georgia Institute of Technology, Atlanta
Thesis: *ASSCI – Adaptive Switch for Scanning Control Interface*
Advisor: Gregory D. Abowd, Thad Starner
- B. Tech. Information Technology** Aug. 2008 - May 2012
Institute: Netaji Subhas Institute of Technology (NSIT), Delhi University
Thesis: *Drishhti – Realtime Multi-language Snapshot Translation and Speech System*
Advisor: Mohinder P.S. Bhatia

AWARDS

- A15. **Best position paper**, International Workshop on Energy Harvesting & Energy-Neutral Sensing Systems, 2022
- A14. Finalist, Fast Company Design Innovation Competition in Experimental Category for work on a computational facemask, 2022
- A13. **Outstanding Graduate Research Assistant Award** in Georgia Tech's College of Computing, 2022
- A12. **Gvu foley Scholar**, Georgia Institute of Technology, 2021
- A11. Winner, **ACM Ubiquitous Computing Gaetano Borriello Outstanding Student Award**, 2021
- A10. Scholarship recipient, Richard Tapia Celebration of Diversity in Computing Conference, 2021
- A9. **EECS Rising stars**, Massachusetts Institute of Technology, 2021
- A8. Honoree, Fast Company Design Innovation Competition in Experimental Category for work on self-powered stickers, 2021
- A7. Young researchers, Heidelberg Laureate Forum, 2020

- A6. **Distinguished Paper**, ACM Ubicomp conference, 2019
- A5. **Best poster**, ACM MobiSys conference, 2019
- A4. **Best poster**, ACM UIST conference, 2018
- A3. Final round, Qualcomm Innovation Fellowship, 2018
- A2. 2nd position in powering internet of things poster presentation, NextFlex Workshop, 2017
- A1. **Faces of Inclusive Excellence**, Georgia Tech, 2015

FELLOWSHIPS

- F8. \$550 travel grant by GT's GVV and SGA for attending ACM MobiSys Conference, 2022
- F7. \$30,000, graduate research assistant position sponsored by HEERF Covid funds, Georgia Tech, 2022
- F6. **\$180,000 research grant** by Cisco for my Ph.D. dissertation, 2021
- F5. \$1000 Travel Scholarship by College of Computing, Georgia Tech, 2019
- F4. \$50,000 NSF I-Corps Commercialization grant for Self-sustainable Building Water Leak Detection project 2019
- F3. \$2000 provost travel grant, Career Research and Innovation Development Conference (CRIDC), Georgia Tech, 2019
- F2. \$1500 Travel grant by Career, Research, and Innovation Development Conference (CRIDC), Georgia Tech, 2018
- F1. \$18,000 international research fellowship, American Association of University Women (AAUW), 2016

EMPLOYMENT

- **Assistant Professor, ECE Department**
Northwestern University Sept 2023 - Present
 Building Sustainable Computational Materials
- **Breed Junior Professor of Design**
Northwestern University June 2023 - Present
- **Postdoctoral researcher, Kamoamoa Ubicomp Lab**
Georgia Tech Jan 2023 - Aug 2023
Advisors: Josiah Hester
 Designing future sustainable computational things for applications spanning biodiversity monitoring, health, and smart homes.
- **Graduate Research Assistant, Ubicomp Lab**
Georgia Tech Aug 2016- Dec 2022
Advisors: Gregory Abowd, Thad Starner
 Built sustainable interactive stickers for indoor sensing applications.
 Project funded by Cisco \$180,000
- **Research Intern, Urban Innovation Initiative**
Microsoft Research Lab, Redmond Summer 2019
Manager: Vaishnavi Ranganathan, Victor Bahl
 Built cheap, wearable, low-power gas sensor to allow the democratization of air quality for increased awareness about the environment.
- **Research Intern, Anticipatory Computing Lab**
Intel Research Lab Summer 2015
Manager: Lama Nachman
 Designed finger motion sensing ring and its algorithm to enable people with Motor Neuron Diseases (MND) to type using Intel's ACAT.

- **Graduate Research Assistant, Brain Lab**
Georgia Tech Aug 2014 - May 2016
Advisors: Thad Starner, Melody Moore Jackson
 Performed exploratory study to assess the potential of using customized ear electrodes for ear-EEG-based mobile wearable Brain-Computer Interfaces (BCIs) using Google Glass. Project funded by Google for \$80,000.
- **Graduate Research Assistant, Ubicomp Lab**
Georgia Tech Jan 2015 - May 2015
Advisors: Gregory Abowd
 Developed and tested the usability of software that video records autistic children at home and annotates video streams to flag and review content. Funded by Simons Institute.

PUBLICATIONS

- C14. (Under review ACM IMWUT) B. Yen, P. Sahinidis, S. Bernstein, L. Jaliff, G. Marcano, C. Josephson, P. Pannuto, W. Shuai, G. Wells, **N. Arora**, J. Hester. **Soil-Powered Computing: Application-Driven Design Space Exploration for Sustainable Computing Futures**
- C13. Y. Do, **N. Arora**, A. Mirzazadeh, I. Moon, E. Xu, Z. Zhang, G. Abowd, S. Das. **Powering for Privacy: Improving User Trust in Smart Speaker Microphones with Intentional Powering and Perceptible Assurance** In 32nd USENIX Security Symposium, Aug 2023.
- C12. **N. Arora**, V. Iyer, H. Oh, G.D. Abowd and J. Hester. **Circularity in Energy Harvesting Computational Things**: In The 20th ACM Conference on Embedded Networked Sensor Systems (SenSys22), November 6–9, 2022. [**Best Position Paper, ENSsys Workshop**]
- C11. D. Zhang, C.F. Hernandez, Y. Li, J.W. Park, Y. Wang, Y. Zhao, **N. Arora**, A. Mirzazadeh, Y. Do, T. Cheng, T. Starner, and G.D. Abowd. **Flexible Computational Photodetectors for Self-Powered Activity Sensing**. NPJ Flexible Electronics, January 2022
- C10. A. Curtiss, B. Rothrock, A. Bakar, **N. Arora**, J. Huang, Z. Enghardt, A. Empedrado, C. Wang, S. Ahmed, Y. Zhang, N. Alshurafa, J. Hester. **FaceBit: Smart Face Masks Platform**. Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies, December 2021. [**Finalist, Fast Company’s Innovation by Design Competition, Featured in Scientific American**] [article link](#) [project website](#)
- C9. **N. Arora**, A. Mirzazadeh, I. Moon, C. Ramey, Y. Zhao, D. Rodriguez, G. D. Abowd and T. Starner. **MARS: Nano-Power Battery-free Wireless Interfaces for Touch, Swipe and Speech Input**. Proceedings of the 34th Annual ACM Symposium on User Interface Software and Technology, October 2021. [short video](#) [talk video](#) [**Honoree, Fast Company’s Innovation by Design Competition**]
- C8. **N. Arora**, T. Starner and G. D. Abowd. **SATURN: An Introduction to the Internet of Materials**. Communications of the ACM. January 2021. [**20,000 downloads**]
- C7. A. Waghmare, Q. Xue, D. Zhang, Y. Zhao, S. Mittal, **N. Arora**, C. Byrne, T. Starner, and G. D. Abowd . **UbiquiTouch: Self-Sustaining Ubiquitous Touch Interfaces**. Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies. March 2020. [video](#)
- C6. Y.K. Meena, X.D. Yang, M. Löchtefeld, M. Carnie, N. Henze, S. Hodges, M. Jones, **N. Arora** and G.D. Abowd. **Self-Sustainable CHI: Self-Powered Sustainable Interfaces and Interactions**. Extended Abstracts of CHI Conference on Human Factors in Computing Systems. April 2020. [workshop link](#)
- C5. **N. Arora**, J. Yu, H. Oh, T. Starner and G. D. Abowd. **SATURN: Technical and Design Challenges in Building a Self-sustainable Sound and Vibration Sensing Material**. GetMobile: Mobile Computing and Communications. January 2020. [**ACM SIGMOBILE Research Highlights**] [article](#)
- C4. **N. Arora**, Q. Xue, D. Bansal, P. McAughan, R. Bahr, D. Osorio, X. Ma, A. Sample, T. Starner and G. D. Abowd. **Surface++ – A Scalable and Self-sustainable Wireless Sound Sensing Surface**. In Proceedings of the 17th ACM Annual International Conference on Mobile Systems, Applications, and Services, MobiSys (pp. 543-544). June 2019. [**Best Poster**] [pdf](#)

- C3. **N. Arora**, and G. D. Abowd. **ZEUSSS: : Zero Energy Ubiquitous Sound Sensing Surface Leveraging Triboelectric Nanogenerator and Analog Backscatter Communication** Adjunct Publication of the 31st Annual ACM Symposium on User Interface Software and Technology. October, 2018. [**Best Poster**] [pdf](#)
- C2. **N. Arora**, S. L. Zhang, F. Shahmiri, D. Osorio, Y.-C. Wang, M. Gupta, Z. Wang, T. Starner, Z. L. Wang, and G. D. Abowd. **SATURN: A thin and flexible self-powered microphone leveraging triboelectric nanogenerator.** Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT), Volume 2 (2). June 2018. [**Distinguished Paper (Top 3% of accepted papers)**] [pdf](#) [video](#)
- C1. **N. Arora**, L. Freil, I. Walker, T. Starner, M. M Jackson. **Towards Mobile and Wearable Brain-Computer Interfaces.** Proceedings of the 6th International Brain-Computer Interface Meeting, organized by the BCI Society. May 2016 [pdf](#)

PATENTS

- P3. **Systems And Methods For Multi-Channel Ambiently-Powered Real-Time Sensing.** Filed: April, 2021. Patent Application: 63/231,930, GT provisional: 8734
- P2. **Self-powered Wireless Identification Barcode based on Triboelectric Nanogenerator and Backscatter Communication.** Filed: Dec, 2020, GT provisional: 8653
- P1. **A Thin and Flexible Self-Powered Microphone Designed on the Principle of Triboelectric Nanogenerator.** Granted: US Patent 10,932,063

POSTERS and DEMOS

- D10. MARS: Nano-Power Battery-free Wireless Interfaces for Touch, Swipe, and Speech Input. ACM Symposium on User Interface Software and Technology. October, 2021
- D9. CO-SENSE: Self-sustainable Carbon-Monoxide Gas Sensing Material. Microsoft Research Internship Showcase, Redmond, WA. August, 2019.
- D8. Surface++ – A Scalable and Self-sustainable Wireless Sound Sensing Surface. ACM MobiSys - Annual International Conference on Mobile Systems, Applications, and Services, South Korea. June, 2019.
- D7. Self-sustainable Water Leak Detection System, Career, Research and Innovation Development Conference, Georgia Tech, Atlanta, GA. November, 2018. [**Winner \$2000 grant**]
- D6. ZEUSSS: : Zero Energy Ubiquitous Sound Sensing Surface Leveraging Triboelectric Nanogenerator and Analog Backscatter Communication. ACM Symposium on User Interface Software and Technology. October, 2018. [**Winner**]
- D5. SATURN: A thin and flexible self-powered microphone leveraging triboelectric nanogenerator. ACM Ubicomp Conference, Singapore. October, 2018.
- D4. SATURN: A thin and flexible self-powered microphone leveraging triboelectrification. Career, Research, and Innovation Development Conference, Georgia Tech, Atlanta, GA. November, 2017 [**2nd Position**]
- D3. SATURN: A thin and flexible self-powered microphone leveraging triboelectrification. NextFlex: Powering the Internet of Everything by Georgia Electronic Design Center (GEDC), Atlanta, GA. September, 2017 [**2nd Position**]
- D2. SATURN: A thin and flexible self-powered microphone leveraging triboelectrification. CRNCH (Center for Research into Novel Computing Hierarchies) Center Summit, Atlanta, GA. September, 2017
- D1. ASSCI : Adaptive Switch for Scanning Control Interface. Gvu Center Research Showcase, Georgia Institute of Technology. April, 2016

TEACHING EXPERIENCE

- Teaching Assistant, Artificial Intelligence Summer 2020 , Fall 2020
- Teaching Assistant, Mobile and Ubiquitous Computing Summer 2022 , Spring 2017, Spring 2019
- Teaching Assistant, Graduate Group Orientation Course Fall 2018
- Teaching Assistant, Introduction to Artificial Intelligence Summer 2018
- Mentor, Texas Instruments Summer Internship Workshop, Delhi University 2014.
- Student Mentor for Mobile Applications, Google Developer Group (GDG), Delhi 2014.
- Teacher, Each One Teach One, Times of India initiative to teach poor children in Delhi, India 2009

INVITED TALKS

- *Building Sustainable Computational Materials*
 - UIUC CS (Host : Robin Hillary Kravets) April, 2023
 - UVA CS & ECE (Host: Brad Campbell) April, 2023
 - UMass CS (Host: Ravi Karkar and Prashant Shenoy) April, 2023
 - CMU ECE and S3DMarch (Host: Mayank Goyal) March, 2023
 - UCSD CSE and Design Lab (Host : Nadir and Edward Wang) March, 2023
 - UC Berkeley EECS (Host: Sarah Chasins) Feb, 2023
 - University of Chicago CS (Host: Pedro Lopez) Feb, 2023
 - Northwestern University ECE (Host: Russ Joseph) Feb, 2023
 - University of Mich EECS (Host: Alanson Sample) Feb, 2023
 - Tufts University ECE (Host: Thomas Vandervelde) Feb, 2023
 - North Carolina State University CS (Host: Muhammad Shahzad) Feb, 2023
- *Designing Sustainable Computational Things*
 - 9th International Conference on Networking, Systems and Security Bangladesh University of Engineering and Technology Dec, 2022
- *Circularity in Energy Harvesting Computational “Things”*
 - 10th International Workshop on Energy Harvesting Energy-Neutral Sensing Systems, Boston Nov, 2022
- *Self-powered Acoustic Vibration Sensing Stickers: Devices, Systems and Applications*
 - Amazon Lab 126 (Host: Wontak Kim) Aug, 2022
- *Towards Self-powered Interactive Material for Mixed Reality Experiences*
 - HCI Seminar series, Meta Reality Labs (Host: Kashyap Todi) July, 2022
- *Self-powered Acoustic Vibration Sensing Material*
 - 1st ACM International Workshop on Intelligent Acoustic Systems and Applications Workshop, MobiSys, Portland July, 2022
- *Designing for Sustainability in Computing: Self-Powered Computational Material*
 - Brown Bag, GT’s GVU Center May, 2022
- *Self-Powered Vibration Sensing Material*
 - Emerging Tech and Incubation group, Cisco (Host : Ramana Kompella) May, 2022
- *Self-sustainable Wireless Interface Stickers,*
 - Systems and Networking Research Group (SyNRG), UIUC (Host: Romit Roy Choudhury) Dec, 2021
- *Self-sustainable Computational Stickers,*
 - Responsive Environment Group, MIT Media Lab (Host: Joe Paradiso) Oct, 2021
- *Self-sustainable Computational Stickers,*
 - HCI Engineering Group, MIT CSAIL (Host: Stefanie Mueller) Oct, 2021

- *Building self-sustainable gas sensing material*,
Molecular Information Systems Lab,
University of Washington (Host: Luis Ceze) Oct, 2019
- *How to give good poster presentations*, *UbiComp Lab*, Georgia Tech Sept, 2019
- *5th generations of computing: Computational Materials*, Guest Lecture,
Mobile and Ubiquitous Computing, Georgia Tech April, 2019
- *Towards Printable Self-sustainable Sensing*,
HP Labs (Host: Tico Ballagas) Jan 2019

SERVICE

- **Organising Committee** Publicity & Social Media Chairs, ACM UbiComp 2023
- **Technical Program Committee**
IEEE International Green and Sustainable Computing Conference (2023)
ACM CHI Building Devices Subcommittee (2023)
ACM EnSys Workshop (2023)
Work-in-Progress ACM Tangible, Embedded and Embodied Interaction (TEI) (2021)
CHI Late-Breaking-Work (2022)
ACM MobiSys Workshop Digibiom (2022)
- **Conference Session Chair**
ACM UIST On-Body Interaction, 2021
- **Paper Reviewer:**
UbiComp (2016, 2017, 2019),
Mobile HCI (2018),
ISWC (2017,2022),
CHI (2018, 2019, 2020,2021, 2022), UIST(2023,2020),
IUI (2021),
TEI (2021)
- **Student Volunteer** ACM UbiComp Conference, Virtual Event (2020), Ubiquitous Computing Conference in Osaka Japan (2015)
- **Founding Member**, Science for a Billion (SFAB)
Initiative to promote RnD initiatives in India
- **Group Meeting Coordinator**, Computational Materials Group, Georgia Tech 2017-2020
- **Workshop Co-Organiser**, ACM CHI Virtual, Self-SustainableCHI:
Sustainable Self-Powered Interfaces and Interactions [website](#) 2020
- **Panelist** for Georgia Tech MS HCI Seminar, Getting a Ph.D. 2019
- **Workshop Co-Organiser**, ACM UbiComp Conference in Singapore,
Broadening Participation Workshop [website](#) 2018
- **Georgia Tech Grad Group leader** 2018
- **Instructor**, Girls Who Code Georgia Tech Chapter 2017
- **Group meeting coordinator**, Ubiquitous Computing Lab, Georgia Tech 2016-2018
- **Founder**, Mobile Development Group, Delhi University 2011 - 2012

STUDENTS MENTORED

Material Science Engineering

- *Rachel Hobby* (UG) Jan 2023-Present
- *Julia Fleischman*(UG) Jan 2023-Present
- *Claire Joo* (UG) Jan 2023-Present
- *Harsh Kumar Verma* (MS) Aug 2022-Present
- *Sutikshan Bansal* (MS) Aug 2022-Dec 2022
- *Sriram Srirangan* (MS) Aug 2022-Dec 2022

- *Philothei Sahinidis* (UG) Aug 2022-Present

Electrical Engineering

- *Anfisa Bogdanenko* (UG) Aug 2022-Present
- *Injoo Moon* (UG): Research Engineer at MIT Langer Lab Jan 2021-May 2022

Mechanical and Aerospace Engineering

- *Bill Yen* (UG) Oct 2022-Present
- *Mohit Gupta* (Ph.D.): Research Scientist at Apple Aug 2018-Aug2019

Computer Science Engineering

- *Nicolas Cai* (UG): Jan 2023- Present
- *Zhihan Zhang* (UG): Graduate student at UW Oct 2021-May 2022
- *Ali Mirzazadeh* (BS/MS): Graduate student at MIT Sept 2019-May 2022
- *Yunzhi Li* (MS): Graduate student at CMU Jan 2021-May 2021
- *Qiuyue Xue* (MS): Graduate student at UW Feb 2018- May 2019
- *Peter McAugen*(MS) : Software Engineer at Microsoft Sept 2018- May 2019
- *Dhruv Bansal* (UG): Graduate student at Stanford Sept 2018- May 2019

Design and HCI

- *Daniela C. Rodriguez* (UG): UX Designer Adobe Jan 2021-July 2021
- *Jin Yu* (MS): Graduate student at Gatech Aug 2019-Feb 2020
- *Michelle Ma* (MS): UX designer at Amazon Sept 2018- May 2019
- *Diego Osorio* (MS): UX Engineer at SimSpace Sept 2017 - May 2019
- *Fereshteh Shahmiri* (MS): Graduate student at GaTech Sept 2017 - May 2019

REFERENCES

Dr. Gregory D. Abowd, Dean of the College of Engineering and Professor in Electrical and Computer Engineering, Northeastern University, g.abowd@northeastern.edu

Dr. Thad E. Starner, Technical Lead/Manager on Google's Glass and Professor, School of Interactive Computing, Georgia Institute of Technology thadstarner@google.com

Dr. Hyunjoo Oh, Assistant Professor, College of Design and School of Interactive Computing, Georgia Institute of Technology hyunjoo.oh@gatech.edu

Dr. Josiah Hester, Associate Professor, Interactive Computing and Computer Science, College of Computing, Georgia Institute of Technology josiah@gatech.edu

Dr. Canek Fuentes, Associate Professor, Department of Electrical and Computer Engineering, Northeastern University c.fuentes@northeastern.edu