BAVISHA KALYAN

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I am an interdisciplinary scholar rooted in environmental engineering, with my expertise branching into public health. Drawing from decolonial and Black Feminist epistemologies, I aim to continue my work as an interdisciplinary engineer activist designing community-driven and justice-oriented research.

EDUCATION

PhD **University of California, Berkeley**   Anticipated Graduation: May 2024
Department of Civil and Environmental Engineering
Advisor: Professor Maya Carrasquillo
Designated Emphasis 1: Global Metropolitan Studies
Designated Emphasis 2: Development Engineering

MS **University of California, Berkeley**   Dec 2019
Department of Civil and Environmental Engineering
Concentration: Energy, Civil Infrastructure and Climate

BS **Johns Hopkins University**   May 2018
Department of Environmental Health and Engineering

FELLOWSHIPS AND AWARDS

Fellowships:
- Lau Fellowship for Climate Equity, UC Berkeley, 2023
- Center for Democracy and Organizing (CDO) Fellowship, Institute of Governmental Studies   , UC Berkeley, 2022
- Digital Transformations of Development (DToD) NSF Research Traineeship (NRT)**,** UC Berkeley, 2022 & 2023
- NSF InFEWS (Innovations at the Nexus of Food, Energy, and Water Systems)**,** UC Berkeley, 2019

Global MetroPolitan Studies Travel Award, Social Science Matrix, UC Berkeley, 2022

InFEWS Fellow and Fellowship recipient, Developmental Engineering, UC Berkeley, 2019-2024

Environmental Health and Engineering Faculty Award for Service and Academic Achievement, Johns Hopkins University, 2018

KEY GRANTS

Primary Author on Awarded Grants:

"Neighbors Helping Neighborhoods Grant Program", Victoria Foundation & Citizens Bank, 08/01/2023 - 12/31/2024, $20, 000, Primary Author

Rutgers Center for Environmental Exposures and Disease (CEED), 07/01/2023-07/01/2014, $50,000, Primary Author

"Environmental Justice Data Fund", Windward Fund & Google.org, 8/1/2022 - 11/1/2023, $250,000, Primary Author

Lead Free New Jersey Community Hub Recipient, Lead Free New Jersey, 9/1/2022 - 9/1/2023, $50,000, Primary Author

The Fund for New Jersey, $30,000, 9/1/2022 - 9/1/2022, Primary Author

Key Author on Grant Proposals with Varying Outcomes:

Center for Disease Control (CDC), "Supporting Communities to Reduce Lead Poisoning", Submitted August 2023, Primary Author - Outcome: **Approved by Unfunded, pending until 2024**

Dodge Foundation, "Lead Risk Center in Newark, NJ", Submitted July 2023, Primary Author - Outcome: Not awarded

Environmental Protection Agency (EPA)- 19th Annual People, Prosperity and the Planet (P3) National Student Design Competition, "Pb Pipe Corrosion Layer Monitoring System", Primary Author - Outcome: Peer-reviewed, We retracted the application

Environmental Protection Agency (EPA) - 19th Annual People, Prosperity and the Planet (P3) National Student Design Competition, "Community-centered machine learning for equitable lead remediation", Primary Author - Outcome: Peer-reviewed, Not awarded

Awaiting Notice on Submitted Grants:
Environmental Justice Collaborative Grant (EJCPS) by Environmental Protection Agency (EPA), "Building a Healthy Newark: Tackling Lead Poisoning in the East, South, and West Wards of Newark, New Jersey", Key Contributor and Writer - *Awaiting notification*

Footlocker and LISC, "Waterbenders Scholars Program", Primary Author, Outcome: *Awaiting notification*

Exelon Green Lab, "Waterbenders Lab Scholars and STEM engagement", Primary Author, Outcome: *Awaiting notification*

RESEARCH EXPERIENCE

Mobile Lead Testing Unit Project: Co-creating equitable data science decision-making tools for critical infrastructure by incorporating local information and multi-stakeholder perspectives in Newark, NJ
University of California, Berkeley, Berkeley, CA, USA | Newark, NJ, USA   2020 - Present
Doctoral Researcher – JEDI (L)ab
- Coordinated a multi-stakeholder collaboration to understand how key decision makers and community members consider and implement equity in their lead remediation and abatement efforts.
- Co-designed and implemented the Mobile Lead Testing Unit to understand comprehensive lead exposure in Newark residences.
- Adopted a Community Based Participatory Action Research approach to my research using qualitative (surveys, interviews, and focus groups) and quantitative methods
- Drafted and received IRB approval for the project while ensuring the Newark Water Coalition retains ownership over the data collected
- Managed a team of 25 people who are measuring lead concentration in water, paint, soil, and dust, sharing accessible resources on lead remediation, and providing tenant support and lead abatement and remediation services for homeowners and tenants.
- Built capacity and structure for the Newark Water Coalition to own and manage the dataset following IRB protocols, to improve collaboration between policy makers and community organizations.
- Led multiple public workshops to teach residents about lead exposure and remediation efforts, how the testing unit project will advance social justice efforts, and educational tutorials using data science tools.
- Preparing to publish findings in a publicly accessible format, and host additional workshops to engage stakeholders with the findings.
- Press release: https://nextcity.org/urbanist-news/these-community-water-testers-proved-that-newark-is-not-in-fact-lead-free

Predicting high levels of lead exposure using machine learning
University of California, Berkeley, Berkeley, CA, USA   2020 - 2021
Graduate Student Researcher – Gadgil Water Laboratory
- Developed one of the first of its kind machine learning model to predict childhood elevated blood lead levels using publicly available aggregated data for the state of New York and Massachusetts.
- Built dataset from chemical, geographical, and socioeconomic characteristics gathered from publicly available and Census datasets.
- Compared and evaluated multiple supervised and unsupervised models, used GIS to facilitate preprocessing, and determined which of 100+ features/attributes to consider to build a model tuned for increased accuracy.
- Contributed significantly to manuscript writing and editing for publication

Identifying arsenic-contaminated groundwater in India using machine learning
University of California, Berkeley, Berkeley, CA, USA   2019 - 2020
Graduate Student Researcher – Gadgil Water Laboratory
- Collaborated with a research team from Dept. of Energy and Environment at the TERI School of Advanced Studies in Delhi, India, to build a predictive machine learning model to identify hot spots of arsenic contamination.
- Developed a method using statistical bootstrapping to identify uncertainty and limitations of machine learning models.
- Generated high resolution predictive maps of Arsenic contamination across continental India's groundwater

- Edited and contributed to manuscripts

Accelerated Lead Pipe Scale Build-up (ALPS)
University of California, Berkeley, Berkeley, CA, USA   2019 - 2020
Graduate Student Researcher – Gadgil Water Laboratory
- Systematically tested electrochemical deposition of organic and inorganic coatings to prevent lead leaching from lead pipes in drinking water systems.
- Developed a novel Aluminum Oxide protective coating deposited through an electrical current to stabilize the lead corrosion layer.
- Maintained a six-month recirculating pipe loop system and tested effluent water and scale compositions using analytical instruments, such as scanning electron microscopy (SEM) and energy dispersive X-ray spectroscopy (EDS), Raman Spectroscopy, and X-ray absorption fine structure (XAFS). Analysis was conducted at the Lawrence Berkeley National Laboratory Molecular Foundry and the Advanced Light Source (ALS).
- Mentored undergraduate students on laboratory experiments, safety, and analysis
- Created onboarding documents, safety procedures, and chemical inventory systems for the laboratory

Electrochemical Regenerating Ion Exchange Resins (ERI) for Desalination
University of California, Berkeley, Berkeley, CA, USA   2019 - 2020
Graduate Student Researcher – Gadgil Water Laboratory
- Fabricated electrically-regenerated ion-exchange technology (ERI) electrodes to reduce environmental toxicity in the production process compared to conventional solvents.
- Performed electrochemical and material characterization of coated carbon-titanium electrodes.
- Designed and ran a continuous flow experiment and tested contaminants in effluent water using Ion Chromatography to evaluate the effectiveness (proportion of salt removed) of the technology

Microbial resistance to antibiotics - Triclosan in wastewater
Johns Hopkins University, Baltimore, MD, USA   2017 - 2018
Undergraduate Student Researcher – Professor Edward Bouwer & Dr. Hannah Gray
- Independently cultured microorganisms from weekly wastewater samples and utilized sterile technique to plate, isolate, and grow microbial cultures.
- Tested and collected long term antimicrobial resistance profiles to triclosan and similar antimicrobial chemicals.
- Extracted DNA from microbial stocks and prepared for Polymerase Chain Reaction (PCR)-based genetic sequencing.

Mechanics of Trees, Ecosystems Lab
Oxford University, Oxford, UK   Summer 2017
Undergraduate Student Researcher – Professor Yadvinder Mali & Dr. Tobias Jackson
- Analyzed three months of anemometer data in MATLAB to find correlations between wind speed, tree strain, and phenology.
- Compiled data and tree characteristics to be combined with LiDAR scans in an ABACUS model.
- Summarized information in graphs for conference presentation at International Union of Forest Research Organizations (IUFRO), and for journal publication.

PROFESSIONAL AND ENGINEERING EXPERIENCE

Peoples Public Lab, Newark, NJ   January 2022 - Present

Executive Director
- A new nonprofit organization created by academic and grassroots activists as a platform for continuing community-engaged projects
- An upcoming project is on understanding youth perspectives of environmental justice. This will be realized through workshops, a walking tour, and a photovoice project.

Engineers Without Borders, Johns Hopkins University   Aug 2016 - Jun 2018
Project Lead –Water Distribution, Chicorral Guatemala
- Compared the efficiency of a solar panel pump system to the initial design specifications to ensure the community of Chicorral is receiving adequate water.
- Led a survey travel team to hold community meetings to support the implementation of a new water tax in Chicorral to incentivize sustainable behavioral change.
- Oversaw 10 students working on technical system analysis, grant applications, and culturally appropriate communication materials.
- Acted as a technical facilitator in meetings between the local municipal government and the Chicorral Water committee to advocate for climate relief funds to help rebuild the river banks after extreme weather events.

Energy Team, Philadelphia Water, Philadelphia, PA   Sep 2015 - Mar 2016
Engineering Co-Op
- Built a Microsoft Access database incorporating complex queries and customized reports for the management of Philadelphia Water's utility data, greenhouse gas emissions inventory, and renewable energy metrics.
- Collected long-term energy usage data from water and wastewater treatment plants and developed analysis protocols.
- Standardized and streamlined Energy Program Annual Report production processes.
- Created interpretive guides and instructions for energy database use and maintenance for members of the team.

Engineers Without Borders, Drexel University   Sep 2014 - Aug 2016
Project Lead – Clean Water Project: Miramar, El Salvador
- Constructed steel and wood mold for concrete prototyping of slow sand water filters.
- Created a community education program in multiple languages to promote community empowerment, engagement, and sustainability.
- Led team to Miramar, El Salvador to implement biosand filters and assesses for feasibility of rainwater systems.

TEACHING EXPERIENCE

University of California, Berkeley, Berkeley, CA   Spring 2022
Teaching Assistant, CE 290: Inclusive Infrastructure
Description: Civil and Environmental department course for graduate students. Covering topics of positionality, power and privilege, theories of inclusive infrastructure, qualitative research methods, EcoDistricts and Envision for Sustainable Communities, and inclusive science communication tools.
- Mentored student groups through planning their community project.
- Assisted with class scheduling, design, and guest lectures from a range of disciplines.
- Presented two lectures on "Race, Power & Privilege" and "Inclusive Communication".

University of California, Berkeley, Berkeley, CA   Spring 2021

Teaching Assistant, CE 105: Design for Global Transformation
Description: Students worked in small teams representing the following infrastructure sectors: Nature-Based Solutions, Transportation, Food, Industry, Buildings, and Energy. They used the design process to work alongside stakeholders in the city of Stockton to research, imagine, and design strategies to help the Stockton AB 617 community reduce air pollution and tackle climate change.
See final presentations here: https://chow.ce.berkeley.edu/teaching/ce-105-spring-2021/

- Created lessons plans to teach python GIS mapping tools
- Developed syllabus for a new iteration of this course for 25 undergraduate students.
- Mentored student teams who performed a systems analysis for the AB 617 Steering Committee in Stockton, CA.
- Graded student reports, presentations, and provided feedback throughout the course.

University of California, Berkeley, Berkeley, CA   Spring 2020
Teaching Assistant, CE 105: Design for Global Transformation
Description: This new course for undergraduate students in Civil and Environmental Engineering at UC Berkeley placed students in small teams where they were challenged to research, imagine, and design a planetary-scale strategy with the potential for real-world transformation. Building upon the Exponential Roadmap—a global strategy to halve greenhouse gas emissions by 2030—the students were organized into six teams representing the following sectors: Nature-Based Solutions, Transportation, Food, Industry, Buildings, and Energy. They used the design process to
See final presentations here: https://chow.ce.berkeley.edu/teaching/ce-105-spring-2021/

- Mentored student teams who worked across sectors of the design process of creating imaginative, global design solutions for climate change.
- Helped students with geospatial analysis using python and ArcGIS.
- Adapted discussion section and lessons for virtual lessons when we switched to Zoom due to the COVID-19 pandemic.

University of California, Berkeley, Berkeley, CA   Fall 2018, Spring 2019
Teaching Assistant, Physics 8A: Classical Mechanics
Description: An introductory college-level physics course covering kinematics, dynamics, circular motion and gravitational force, energy, momentum, simple harmonic motion, and torque and rotational motion. The course is built for students to cultivate their understanding of physics through classroom activities, interactive, inquiry-based laboratory work where they build on their knowledge such as fields, force interactions, conservation, and waves.

- Independently designed lesson plans and problems based on class material for two classes of 25 students which met twice a week and coordinated lesson schedule and material with ten other graduate student instructors and two professors.
- Planned an exam review preparation and held a lecture to over 50 students for exam preparation.
- Prepared and guided students through laboratory exercises to connect their theoretical knowledge to physical applications.

Johns Hopkins University, Baltimore, MD   Aug 2017 to Dec 2017
Teaching and Lab Assistant, Statics & Mechanics of Materials
Description: A Civil & Environmental required undergraduate-level course combining statics (principles of classical mechanics applied to the equilibrium of particles and rigid bodies at rest, under the influence of various force systems) with mechanics (the study of deformable bodies and the relationships between stresses and deformations within those bodies). Concepts used include free body diagrams, the analysis of simple structures, centroids and centers of gravity, and moments of inertia. The mechanics of materials focused on the

elastic analysis of axial force, torsion, and bending members to determine corresponding stresses and strains. In addition, students were introduced to stress transformations and principal stresses.

- Reviewed major concepts and worked through problem sets with peers during office hours
- Guided students through hands-on laboratory exercises per topic chapter

PUBLICATIONS

Peer-Reviewed Journal Publications

Kalyan, **Bavisha**, Anthony Dwayne Diaz, Jaila Adams, Romir Anand, Kevin Alexander Cenac, Cristian Cerrato, Porsche Cooper, Walter Diaz, Daniel Feliciano, Nadia Fradkin, Earl Godfrey, Jermaine Hargrove, Sabrina Hunte, Aoi Uchima Morel, Ravin Ramsaran, Saeed Idrees Rayman, Jessica Roberson, Delon Smith, Jada Wakefield, Nia Wakefield, Saneitta Wicks, Ammar Zayn Williams, and Maya Carrasquillo. "Community Scientists of the Newark Water Coalition Are a New Dawn for Community-Owned and Managed Research Projects: Mobile Lead Initiative." *Environmental Justice Special Issue: Liberation Science: Using Liberation Pedagogies and Knowledge Systems to Build Communities of Resistance to Address Environmental and Climate Injustices* (**accepted**, forthcoming, 2023).

Hackl, Lukas, Shao-Wei Tsai, **Bavisha Kalyan**, Chia-Hung Hou, and Ashok Gadgil. "Electrically Regenerated Ion-Exchange Technology: Leveraging Faradaic Reactions and Assessing the Effect of Co-Ion Sorption." *Journal of Colloid and Interface Science,* 623 (2022): 985–91. https://doi.org/10.1016/j.jcis.2022.05.104.

Lobo, Gabriel Pablo, **Bavisha Kalyan**, and Ashok Gadgil. "Electrochemical Deposition of Amorphous Aluminum Oxides on Lead Pipes to Prevent Lead Leaching into the Drinking Water." *Journal of Hazardous Materials*, 423 (2022): 127195. https://doi.org/10.1016/j.jhazmat.2021.127195.

Lobo, Gabriel Pablo, **Bavisha Kalyan**, and Ashok Gadgil, "Predicting childhood lead exposure at an aggregated level using machine learning." International Journal of Hygiene and Environmental Health, 238 (2022): 113862. https://doi.org/10.1016/j.ijheh.2021.113862

Jackson, Tobias, Alexander Shenkin, **Bavisha Kalyan,** Jessica Zionts, Kim Calders, Niall Origo, Mathias Disney, Andrew Burt, Pasi Raumonen, and Yadvinder Malhi. "A New Architectural Perspective on Wind Damage in a Natural Forest." *Frontiers in Forests and Global Change,* 1 (2019). https://doi.org/10.3389/ffgc.2018.00013.

Textbook Chapter (in press)

Bavisha Kalyan, Anthony Diaz, Maya Carrasquillo, "Engineering, Environmental Justice, and Data Science in Solidarity." *Mitigating Bias in Machine Learning, McGraw Hill,* (2022)

Description: This textbook provides a framework which draws upon systems thinking (systems mapping and stakeholder mapping), primary data collection methods (surveys, interviews, focus groups), participatory methods for determining feature selection, how to drawing on CBPR methods to obtain feedback, iterate model, and facilitate transparency, communication, and set up infrastructure to ensure the ownership of the data remains with vulnerable stakeholders as well as does not get re-used without participant consent.

Conference Papers

(Peer-Reviewed)

Tsai, Shao-Wei, Arkadeep Kumar, **Bavisha Kalyan**, Chia-Hung Hou, Pen-Chi Chiang, and Ashok J. Gadgil. "Additive Manufacturing of Electrodes for Desalination." *Procedia Manufacturing* 34 (2019): 252–59. https://doi.org/10.1016/j.promfg.2019.06.147.

PATENTS

<u>Pending - Accelerated Lead Pipe Scale Build-up</u>
Gadgil, A.J., Bandaru, S.S., Lobo, G.P., Kalyan, B., "Accelerated Pipe Scale-buildup," United States Patent.

PRESENTATIONS

Planned and Hosted Public Workshops
- Preparing for College, Newark, NJ, July 2023
- Mobile Lead Testing Unit Data Shareback, Newark, NJ, Jan 2023
- How to Apply to College, Newark, NJ, Oct 2022
- Data Analysis and Mapping with Python Workshop, Newark Water Coalition, Newark, NJ, August 2022
- Community Health Day, St Stephans Church, Newark, NJ , May 2022

Research Presentations

"*A portable X-Ray Fluorescence machine ignites a city-wide community science campaign*", U.S. Environmental Protection Agency and U.S. Department of Housing and Urban Development Lead-Based Paint Workshop, November 2023.

"*Community data science: Newark Water Coalition Mobile Lead Initiative for community owned and managed research*", Association of Environmental Engineering and Science Professors, July 2023.

"Timeline of conducting community-engaged research", Inaugural Seminar for Community Engaged Engineering for Civil and Environmental Engineering (CEE[2]), UC Berkeley, Oct 27, 2022.

 "*Electrodes in Electrochemically Regenerated Ion-Exchange based Water Treatment*", Bay Area Water Sanitation and Hygiene (WASH) Symposium, May 3, 2019.

Poster Presentations

"*Machine (Un)learning as a tool for lead remediation: the missing link towards just and equitable water access*", Association of Environmental Engineering and Science Professors, June 2022.

"*Additive Manufacturing of Electrodes for Desalination,*" 47th North American Manufacturing Research Conference, June 2019.

PROFESSIONAL TRAINING

ESRI Spatial Data Science MOCC, Summer 2022

Data Science for Social Justice Workshop, Summer 2022

Berkeley Representative in the Abu Dhabi Future Sustainability Leaders Program, January 2020

Engineering in Training, FE, August, 2018

ORGANIZATIONAL LEADERSHIP AND PROFESSIONAL SERVICE

Civil and Environmental Engineering for Anti-Racism, Co-Coordinator   2022 - Present
- Developed Strategic Plan for with two main projects initiatives, checkpoints, and accountability structures for the 2022-2023 school year
- Cultivated a community culture through establishing safe and welcoming community norms, discussions centered on critical and difficult topics, and refining constitution and bylaws to formalize these processes
- Organized and facilitated discussion students and faculty around sensitive topics such as racism, sexism, harassment, and bullying

International Panel of Climate Change, Assistant Author   2021
- Evaluated past literature for Chapter 18 (Climate Adaptation) and performed a literature review to include in the Working Group II (WG2) Sixth Assessment Report (AR6).
- Worked with an international team of researchers to coordinate writing and editing the report, built a list of relevant and current citations, and designed and edited figures.
- Supported researchers through the editing process to ensured that the report matched the technical requirements, government critiques and desires, and represented rigorous and current research.

Climate and Impacts Research Hub, Founder and Co-Organizer   2020 - Present
- Created a graduate student driven and run virtual and physical space at UC Berkeley for a cross-university interdisciplinary seminar presentation for graduate students to share and critique their climate-related work and build a network of peers.
- Host monthly sessions where graduate students present their current research related to climate change and future challenges within their field, and facilitate a discussion around how climate research requires interdisciplinary methods and how to take their research findings beyond academia.

Annual Reviews of the Environment and Resources (ARER) Journal,   2020 - Present
Assistant Editor
- Screened review papers for publication in ARER.
- Performed annual analysis on the representation of gender and nationality of ARER authors.
- Facilitated ARER annual committee meeting with a team of assistant editors.

Berkeley Water Center Leadership Committee   2018 - 2021
- Created and implemented onboarding documentation for community norms, workplace logistics and professional development.
- Redesigned the Water Center website to represent student research across both the school of engineering and the college of natural resources

- Planned and hosted community and professional development events centered on writing research objectives, planning, and writing schedules

UNIVERSITY AND PROFESSIONAL SERVICE

NEWARK, NJ
- Lead Free NJ Advocacy Steering Committee, Newark, NJ, Summer 2022 - Present

UC Berkeley, CEE
- Climate, Equity, Environmental Justice Cluster Faculty Hire Student Panel, Spring 2021
- Mentored 10 undergraduate students from underrepresented minority backgrounds through graduate school applications, laboratory experiments, grant and fellowship applications, and data science projects, 2019-Present
- Arsenic Remediation Technologies with students in Allensworth, Summer 2020
- Department of Civil & Environmental Engineering Orientation, Fall 2019, Fall 2020
- Be a Scientist Bay Area Scientists Inspiring Students (BASIS), Fall 2020
- Summer Math and Science Honors (SMASH) Academy, Summer 2019
- Department of Civil & Environmental Engineering Env Engineering Seminar Committee, Fall 2019

Philadelphia, PA
- Workshop School Mentor, 2016-2017
- Urban Tree Connection, Volunteer, 2014-2015

DATA ANALYTIC SKILLS

Programming: Python, MATLAB, RStudio

Modeling: Machine Learning (including proficient experience in Random Forest, Natural Language Processing (NLP), Neural Networks, Linear Regressions, and K-Means Clustering), Geospatial Analysis

Applications: AutoDesk Inventor and CAD, Adobe Illustrator, Adobe Photoshop, ArcGIS