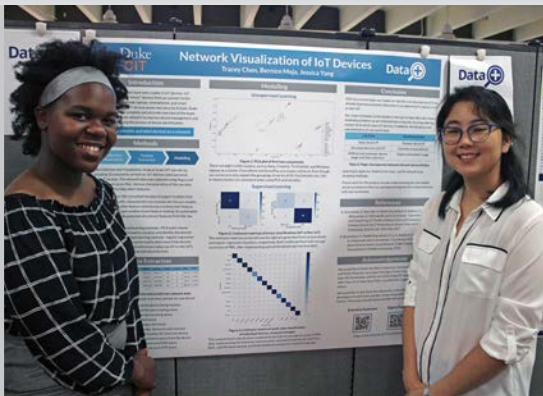
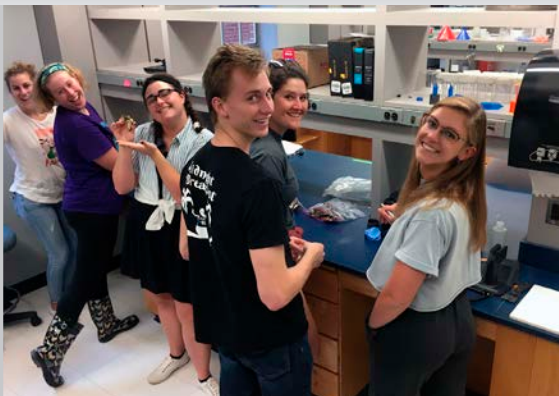


BASS CONNECTIONS

2019
Annual Report
2020



Duke

MESSAGE FROM LEADERSHIP

Amid this moment of tremendous upheaval, we've been reflecting on how exposure to **collaborative, problem-centered research allows Duke students to challenge themselves** and opens avenues for them to make a difference. Now more than ever, we see the strengths of the Bass Connections model in equipping students to grapple with ambiguity, work with others across boundaries, contextualize issues, and take risks to pursue bold ideas.

This year's assessment of undergraduate students, conducted before and after students participated in Bass Connections project teams, found **significant gains in their self-reported ability** to pursue untested ideas, plan and execute long-term projects, identify next steps when stuck, work in teams, and communicate across fields of knowledge.

This past year, as our country and much of the world confronted complex dilemmas about **immigration policies and associated issues** of identity, culture and economics, we created a "pop-up theme" to provide students and faculty the opportunity to address these timely challenges. And in the face of COVID-19, we issued a call for teams that would engage with the myriad **issues posed by the pandemic**, including the inequities that it has so profoundly exposed. The robust response from faculty and students to these special calls underscores their great desire to apply their skills to contribute to the most vital issues of our time.

The pandemic has profoundly reshaped traditional modes of academic engagement. As many of our teams shift to remote or hybrid environments for the coming year, we continue to work with our faculty and staff leaders to experiment with new modes of organizing team interaction. By enabling students to build intellectual bonds with faculty and other students as they conceptualize and carry out significant applied research, **the Bass Connections model offers a crucial means of sustaining community and shared purpose**. This spring, we were impressed by the agility and creativity of our teams as they rapidly adapted to a remote learning environment. Their efforts shone through in our first-ever virtual **Fortin Foundation Bass Connections Showcase**, with many teams contributing videos, lightning talks, research reflections and posters.

This year also brought **our largest number of participants yet**; they came together through 68 year-long project teams, 47 summer research projects and 48 affiliated courses. The vast majority of our teams incorporate participants from external organizations or other universities. As student interest remains strong, we have embarked on a new effort to scale our model. Partnering with Duke Learning Innovation, we launched a faculty fellows program to support almost 20 participants from five schools and three interdisciplinary units as they designed or redesigned **courses that integrate collaborative, project-based learning** as a central component of the learning process.

With the creative energy of Duke faculty, staff and students, and with the support of our donors, we are equipping the next generation of leaders to tackle the vexing problems of today and tomorrow. Thank you for your partnership.



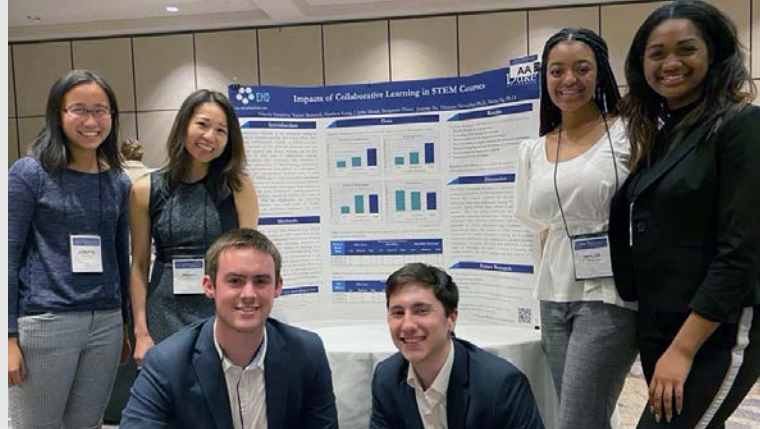
Edward J. Balleisen

Vice Provost for Interdisciplinary
Studies
eballeis@duke.edu



Laura Howes

Director,
Bass Connections
laura.howes@duke.edu



THE BASS CONNECTIONS MODEL

Bass Connections is a university-wide academic program that bridges the classroom and the world beyond campus, giving students a chance to work on solutions to complex societal challenges alongside faculty from all of Duke's schools.

Named in honor of founding donors Anne and Robert Bass, Bass Connections exemplifies Duke's commitment to team-based interdisciplinary research.

EACH YEAR, WELL OVER A THOUSAND UNDERGRADUATES, SEVERAL HUNDRED GRADUATE STUDENTS AND MORE THAN 350 FACULTY AND STAFF participate in Bass Connections through approximately:

- » **60 year-long project teams** that bring together faculty, graduate students, undergraduates and external partners to tackle specific problems
- » **45 one-semester courses** featuring collaborative assignments and interaction with external partners
- » **45 summer projects** conducted over six to ten weeks of intensive research both on and off campus
- » **10 student research awards** for faculty-mentored projects proposed by individuals or small teams



Our vision is to create a distinctive new model for education, predicated on collaborative, interdisciplinary inquiry, that actively engages students in the exploration of big, unanswered questions about major issues confronting society.

By sparking bold ideas, facilitating engagement with local and global communities, and connecting faculty and students from all corners of the campus, Bass Connections supports [President Price's strategic framework](#) for the future of Duke.

Themes

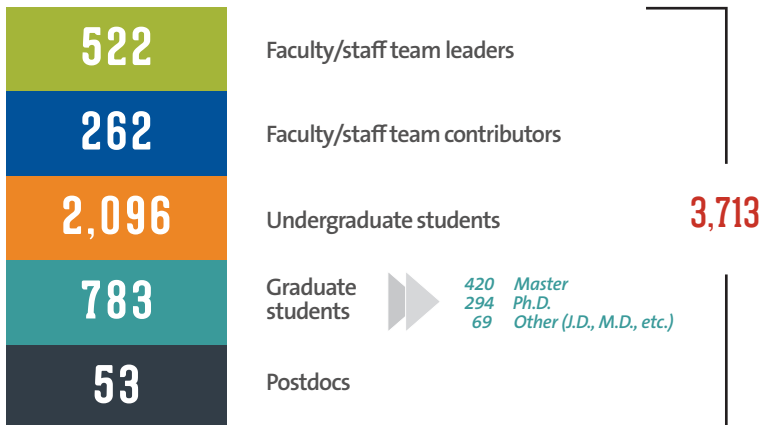
The program's five thematic areas connect faculty and students to societal challenges through project teams, courses and summer programs.

- BRAIN & SOCIETY**
- EDUCATION & HUMAN DEVELOPMENT**
- ENERGY & ENVIRONMENT**
- GLOBAL HEALTH**
- INFORMATION, SOCIETY & CULTURE**

Bass Connections Open provides additional opportunities for projects that align with the Bass Connections model but fall outside of the scope of the five themes.

Duke Participants, Fall 2013 through Spring 2020

3,714 members of the Duke community have taken part in 516 Bass Connections year-long project teams and summer research teams since the program began. Many students and faculty participate over multiple years, but the figures below count each individual only once. These figures exclude one-semester courses, which reach more than 1,000 additional students each year.



Includes project teams and summer programs

External Partners

Fall 2013 through Spring 2020

Most teams work with community partners outside Duke, including nonprofits, universities, school systems, hospitals, government agencies and private companies. Teams have worked with **352 partners in 35 countries on 5 continents** in addition to cities and towns across the U.S. and right here in Durham.

Bass Connections Alumni

For many students, participating in Bass Connections has a profound effect. Numerous graduates continue working on issues they began tackling with their teams, and in some cases, their research experiences have led to further degrees and inspired future plans.



One ongoing Bass Connections project team is dedicated to improving neurosurgical care for patients before and after surgery at Mulago National Referral Hospital in Uganda. The team's interventions have contributed to notable reductions in infection rates – from 40-50 percent to less than 8 percent. **Ten students who participated as undergraduates are now in medical school.**

“We are excited and fortunate to bring with us the skills and experiences we gained from four years of collaborating with Mulago Hospital, Duke Global Neurosurgery & Neurology, and our Bass teammates,” said Samantha Sadler, now at Harvard Medical School.

Five of the students (Suzanna Joseph, Chinemerem Nwosu, Praruj Pant, Akash Patel and Bruno Valan) are now at Duke Med, joining Jared Gloria and Charis Spears, who participated in the project as medical students.



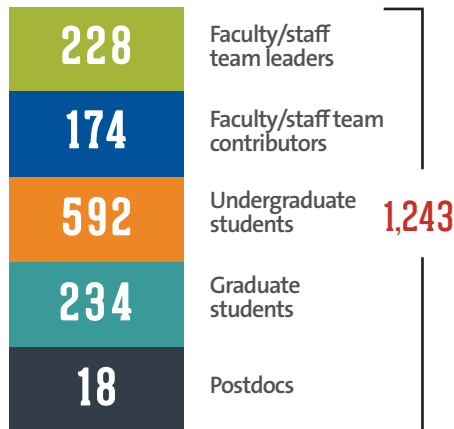
2019-2020 PARTICIPATION

68 project teams, 48 courses, 47 summer research projects teams

Number of Duke Participants

Includes 2019-2020 project teams and 2019 summer programs; figures include several individuals who participated in more than one Bass Connections experience (e.g., a year-long project team and a summer program)

NUMBER OF DUKE PARTICIPANTS IN 2019-2020



FACULTY AND STAFF PARTICIPATION BY SCHOOL, 2019-2020

SCHOOL	NUMBER OF FACULTY/STAFF TEAM LEADERS AND CONTRIBUTORS
Trinity College of Arts & Sciences	105
School of Medicine	84
Nicholas School of the Environment	48
University-wide Institutes, Initiatives, and Centers	46
Pratt School of Engineering	37
Duke Libraries and University Units	35
Sanford School of Public Policy	17
School of Law	11
School of Nursing	7
Divinity School	6
Fuqua School of Business	4
Duke Kunshan University	2

Community Participation

43 of our 68 year-long project teams (63%) had one or more formal community partners or clients, totaling **130 external affiliates**.

5 graduate students and **18 undergraduates** from **other colleges and universities** joined our teams.



2019-2020 SELECTED HIGHLIGHTS

► Fact-checking and Democracy

Fact-checking furnishes a vital defense against the onslaught of falsehoods, hyperboles and half-truths that harm our democracy, health, economy and national security.

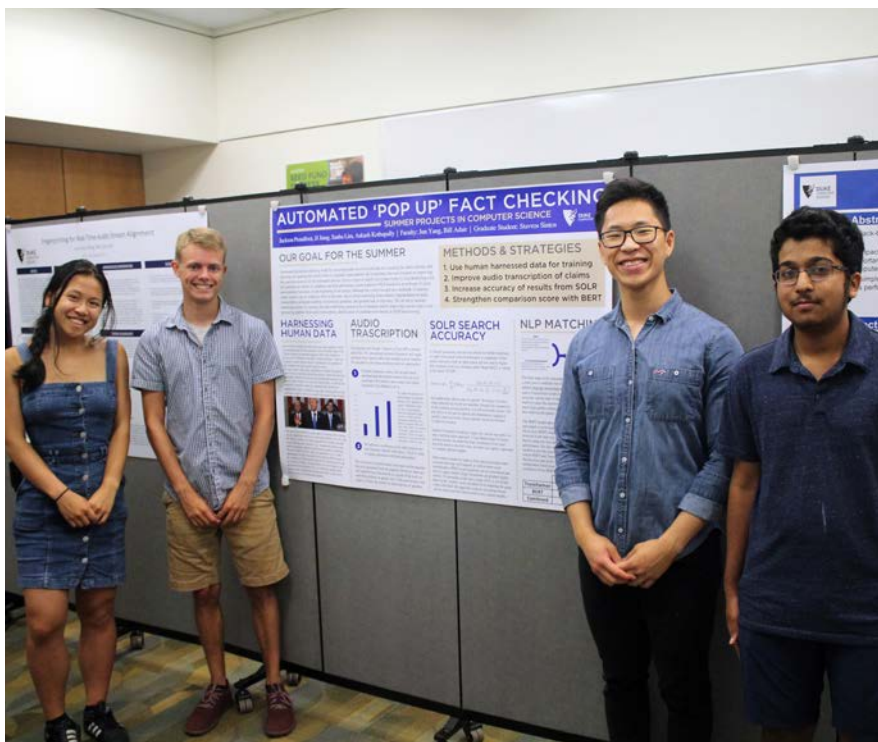
Building on [Data+](#) and [CS+](#) as well as last year's [Bass Connections project](#), this year's [Data and Technology for Fact-checking](#) team furthered the development of an **automated fact-checking system for public use**. A pop-up fact-checking service will allow users to verify statements they hear in real time without having to initiate the research themselves.



Team member Andres Montoya-Aristizabal '22 explained how this system helps **combat the overwhelming number of false claims** made in the news each day: "In order to ensure that a claim is correctly identified as true or false, it needs to be reviewed by a fact-checker. Their work generates fact-checks that we then store in a database, and the automation comes in when these claims are repeated. Repeated claims can be compared with the database to determine whether they are true or false."

Part of this year's project focused on vaccine misinformation. Team members built a taxonomy for common anti-vaccination tropes, developed methods to identify appropriate intervention information, and designed a survey to create a large dataset for training automation algorithms.

Watch the [team's video](#).



TEAM LEADERS

Pankaj Agarwal | Computer Science, Trinity College of Arts & Sciences
Bill Adair | Sanford School of Public Policy
Jun Yang | Computer Science, Trinity College of Arts & Sciences

RESEARCH CONTINUES THROUGH EXTERNAL GRANT

In 2019, the **National Science Foundation** awarded a grant of **\$999,870** to team leader Jun Yang and colleagues for the [development of an open-access resource](#) for debunking misinformation, beginning with use cases on healthcare.



"The success of this proposal owes big thanks to the [Data+ project](#), the Bass Connections projects on [fact-checking](#) and [vaccine misinformation](#) and the [CS+ project](#)," Yang said. "These projects helped lay some of the foundations and preliminary results for the successfully funded proposal."

Immigration

One of the most important issues facing the U.S. and countries around the globe, immigration raises complex questions about identity, culture, economics, social services, health care and security.

In Fall 2019, Duke hosted a two-day Provost's Forum on Immigration in a Divided World, and Bass Connections issued a special call for projects related to this crucial topic. This call represented the second Bass Connections "pop-up theme" (the first focused on [hurricane recovery and resilience](#), and a third will examine the [COVID-19 pandemic](#)).

Three new project teams began tackling research related to immigration in January 2020.

A fourth team (Immigration, Preaching and Religious Imagination) starts in Fall 2020.



Our Bass Connections project has allowed our research team to expand our network of interdisciplinary academic and

community collaborators, something that is critically needed when working to solve complex issues related to immigration policy. These collaborations are going to lay a strong foundation for the work of our team as we aim to translate what we have learned about the health of Latinx immigrants in the current immigration climate to community and policy settings. It has also been energizing to bring a new group of bright and curious students into our research team.

ALLISON STAFFORD

Assistant Professor of Nursing



BIOMETRICS AND IMMIGRATION POLICY

Building on NIH-funded research in Duke's [Science, Law & Policy Lab](#), this [project team](#) examined how the U.S. collects and uses immigrants' biometric data, as well as the ethical tensions between national security and the rights of migrants. The team's findings will inform policy recommendations for best practices for biometric data collection, storage and use.

TEAM LEADERS

Nita Farahany | School of Law

Meredith Van Natta | Science & Society

Our team not only weathered the chaos of the COVID-19 pandemic, but we also leaned into it to think more critically about our topic. The students and faculty brought together a wide range of disciplinary insights to understand the rapidly growing role of biometric technologies in human movement across the globe. Our already timely topic took on new urgency, and we considered the proliferation of emerging biometric technologies during the pandemic. I was so impressed by how the students remained engaged and enthusiastic despite the challenges we faced, and some even collaborated to write and publish an article on thermal facial recognition technology before the semester ended. It was great to see that teamwork in action.



MEREDITH VAN NATTA | Postdoctoral Associate

MENTAL HEALTH OUTCOMES OF LATINX IMMIGRANTS

Building on an existing Duke study, this [project team](#) team partnered with Durham nonprofit El Centro Hispano to learn how local Latinx immigrants engage with media and obtain information on federal, state and local immigration-related events. By integrating data from media sources with data on mental health outcomes, the team gained insight into the relationships among, stress, resiliency and health outcomes in immigrants.

TEAM LEADERS

Irene Felsman | School of Nursing

Gabriela Nagy Carrasquel | School of Medicine

Allison Stafford | School of Nursing

MIGRATION AND DEPORTATION AMONG GUATEMALANS

Governments deport millions of migrants every year. Little is known about the impacts of deportation on migrants, the places they are forced to leave, or the communities where immigration agencies send them.

This [project team](#) examined the Guatemalan deportation crisis from the perspective of both recent deportees in Guatemala City and North Carolina's Guatemalan community.

After analyzing large-scale surveys of deportees in Guatemala City, team members [traveled to Guatemala in March 2020](#) to meet with community organizations and government entities across the country.

View the [team's website](#).



The conversations and site visits were reminders that every policy decision has a human impact as well as a ripple effect beyond its intended outcome. It wasn't until I was able to speak with migrants, families and migrant-serving professionals that I understood the way in which migration and deportation reaches both deep inwards into the Guatemalan psyche and broadly outwards, touching every element of Guatemalan life.

MARIA RAMIREZ | Master of Public Policy student

TEAM LEADERS

Erica Field | Economics, Trinity College of Arts & Sciences

Pamela Lattimore | RTI International

Jay Pearson | Sanford School of Public Policy

Erik Wibbels | Political Science, Trinity College of Arts & Sciences



▶ Collaborative Project Courses

To help meet student demand for project-based learning experiences, Bass Connections partnered with Duke Learning Innovation to launch a [Faculty Fellows](#) program.

Kicking off with a cohort of 17 faculty representing almost as many disciplines, the program featured six months of intensive workshops on course and project design, sustained guidance from Learning Innovation instructors and faculty experts, and peer-to-peer collaboration. This structured engagement enabled fellows to design a new course or reimagine an existing course around a robust project-based experience.

Robert Duvall and Brandon Fain designed a new capstone course for computer science majors that explores the real-world components of being a computer scientist, including ethics, impacts on society, writing and communication, user-centered design, and professional development. Students will work on collaborative projects in small teams.

Cecilia Márquez redesigned an undergraduate course that examines the history of Latinx activism from the 19th century to the present. Using archival materials and oral histories, students will collaborate on small teams to create public-facing digital projects on the history of Latinx activism at Duke.



2019-2020 FACULTY FELLOWS

Instructor Pairs

AARON DININ and **AMANDA GOULD**, Duke Innovation & Entrepreneurship
ROBERT DUVALL and **BRANDON FAIN**, Computer Science, Trinity College of Arts & Sciences
CRYSTAL GRANT, School of Law, and **SCOTT SNIDER**, School of Medicine
DAVID JOHNSTON and **JENNIFER SWENSON**, Nicholas School of the Environment

Individual Instructors

NICOLE BARNES, History, Trinity College of Arts & Sciences
CHARLOTTE CLARK, Nicholas School of the Environment
MARTIN EISNER, Romance Studies, Trinity College of Arts & Sciences
LUCIANA FELLIN, Romance Studies, Trinity College of Arts & Sciences
CHRISTINA LEONARD, School of Nursing
CECILIA MÁRQUEZ, History, Trinity College of Arts & Sciences
EMILY PARKS, Thompson Writing Program, Trinity College of Arts & Sciences
CORINNA SORENSON, School of Medicine
GAVIN YAMEY, Duke Global Health Institute



I got so much out of this group. It was wonderful to work with an interdisciplinary group of colleagues committed to teaching. I successfully designed

a collaborative project course that will serve as a template for other courses I teach in the future. More than that, I gained a wealth of creative activity and discussion ideas to make my classes more engaging. I know my students will benefit from my time in this fellowship for years to come!

CECILIA MÁRQUEZ
Assistant Professor of History



I learned a lot about how my colleagues bring students on board projects, not just with respect to the goals and methods but even about how to evaluate what success looks like and how to support one another. I think that ethos of common ownership is really important, and I appreciated hearing the various ways that faculty build it into their classrooms in different disciplines.

BRANDON FAIN
Assistant Professor of the Practice of Computer Science



Working with people wrestling with the same issues we were, seeing other ideas and from a wide variety of perspectives completely changed both how I

will approach the course and my confidence in presenting a new course. Having my assumptions consistently tested and finding points of view to bring into the creation of a course was such a wonderful experience!

ROBERT DUVALL
Senior Lecturer of Computer Science

▶ Connecting Patients to Resources

Addressing the social determinants of health – such as food security, housing conditions, employment, and education – is a **critical step in reducing health disparities**. Durham’s Lincoln Community Health Center is at the cutting edge of [reimagining the role of primary care](#) by screening for and responding to patients’ social needs. The Bass Connections [Help Desk](#) team designed and implemented a novel approach to support this effort.

Initiated by Duke undergraduates and graduate students, the Help Desk program trains Duke student volunteers to **connect patients with social services and community resources**.

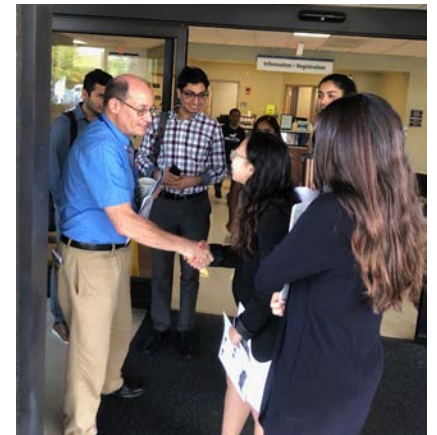
“Many of our volunteers are prehealth and nursing or med students,” said Sahil Sandhu, a Duke senior and team leader, “and they’re learning about the needs of the Durham community. This will help them be better prepared to contribute after they graduate.”



When **COVID-19 interrupted regular activities and increased residents’ need for services**, the team quickly reoriented its focus. Lincoln asked the team to make calls to past patients as well as new ones. Team members recruited additional student volunteers and developed robust online training with modules, case studies, role-playing exercises, database training, and Lincoln onboarding.

The team also merged with the [Duke Student Collaborative on Health Policy](#) to **expand the community resource directory** with the help of 20 students and a partnership with the [Community Empowerment Fund](#).

Listen to an [interview with team members](#) on “The Measure of Everyday Life” radio show and podcast.



TEAM LEADERS

Janet Prvu Bettger | School of Medicine

Connor Drake | School of Medicine

Sahil Sandhu | Program II, Trinity College of Arts & Sciences

Help Desk has strengthened my knowledge about civic and community engagement, which is truly at the heart of what we do [as nurses]. It has inspired me to provide a more person-centered approach to care and take a step back to explore the patient’s background.

ERIKA DENNIS

Accelerated B.Sc. in Nursing student

RESEARCH CONTINUES THROUGH BASS CONNECTIONS

Students and faculty will move this work forward through a 2020-2021 Bass Connections project team, [Help Desk: Scaling Volunteer Models that Address Patients’ Social Needs](#). The team’s partners are Lincoln Community Health Center, North Carolina Central University, Duke Children’s Primary Care Roxboro Street and Duke University Hospital Emergency Room.



help desk

Machine Learning to Inform Energy Access Decisions

One in nine people do not have regular access to electricity, which can have negative impacts on health, educational and economic opportunities, and quality of life. In order to determine the optimal strategy for meeting the needs of communities without access, one must first identify where electricity infrastructure already exists.

This information can **help developing countries decide whether to expand the national grid, construct microgrids, or provide off-grid solar power**. However, current approaches to identifying and mapping energy infrastructure are expensive and time-intensive.

The [Wider Lens on Energy](#) project team built on last year's [team](#) and [Data+](#) summer project. Team members investigated improvements to deep learning models that identify energy infrastructure in satellite imagery. A key adjustment involves **creating and integrating synthetic data (a new approach to this problem) into the AI model training process**. The end goal is to generate maps of power grid networks that can aid policymakers in implementing effective electrification strategies.

Explore the [team's website](#) and watch their [year-end presentation](#).

TEAM LEADERS

Kyle Bradbury | Duke University Energy Initiative
Leslie Collins | Pratt School of Engineering
Jordan Malof | Pratt School of Engineering

My relationship with Kyle Bradbury and my fellow students was amazing, as well as learning about how to ask and test the right questions, use technology that might seem intimidating to get results and keep iterating always!

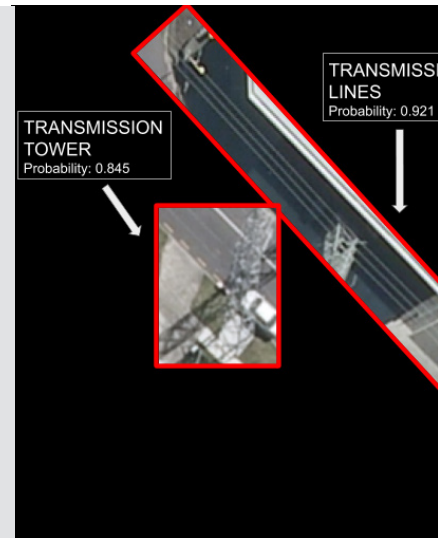
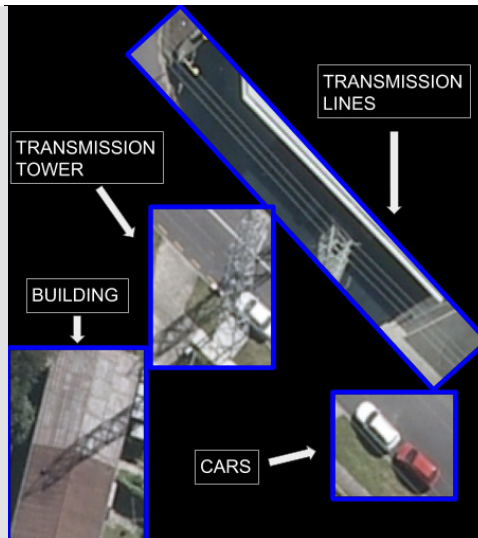
UNDERGRADUATE TEAM MEMBER



RESEARCH CONTINUES THROUGH EXTERNAL GRANT

In 2019, team leaders Kyle Bradbury and Jordan Malof received a **\$974,140 National Science Foundation grant** to create a plan for building a global energy data commons.

"The topics we've been working on with the Bass Connections and Data+ teams helped us build a research presence in the space of energy data collection through machine learning techniques, which I believe made us stand out in this proposal," Bradbury said. "A number of the works that we cited in the proposal were made possible because of past teams and their foundational efforts."





Biodiversity and Infectious Disease

In the villages around Madagascar's Marojejy National Park, population growth and subsistence activities such as farming are encroaching on the protected rainforest. Deforestation impacts wildlife and changes the disease dynamics of biological systems.

Building on the work of previous project teams, the [Social-ecological Networks and Zoonotic Disease in Rural Madagascar](#) team investigated how **decisions about land use are affecting small mammals and disease transmission** between humans and mammals.

In close partnership with the Madagascar Institute for Conservation of Tropical Ecosystems and the Duke Lemur Center–SAVA Conservation Initiative, team members sampled small mammals for infectious disease, expanded to new habitats, and explored how human social networks and patterns of infection interface with the ecological setting.

Team member Courtni France, a Bioethics & Science Policy master's student, received a [Bass Connections Student Research Award](#) to further this work. She evaluated **human health, sustainable agriculture programs and conservation** in the region around Marojejy.

A related [Data+ project](#) used network analysis to investigate the ecological and behavioral factors that determine parasitism in different species of primates.

Explore the [team's website](#).

TEAM LEADERS

Randall Kramer | Nicholas School of the Environment

James Herrera | Duke Lemur Center–SAVA Conservation

Charles Nunn | Evolutionary Anthropology, Trinity College of Arts & Sciences

RESEARCH CONTINUES THROUGH EXTERNAL GRANT

In 2019, the **National Institutes of Health awarded a grant of \$2.4 million** to team leaders Charles Nunn, Randall Kramer and colleagues to [model the ecological and socioeconomic factors](#) that influence disease spread and predict how infectious agents spread from small mammals and domesticated animals to people.



To all early scientists participating in Bass Connections: Immerse yourself in your topics, because we are a privileged group to be participants in these activities. Share what you learned with anyone willing to listen. Bass Connections provides unprecedented access to resources and experiences, and it is our duty to use our platforms to share the connections we make and the lessons we learn with as many people as possible.

COURTNI FRANCE

Bioethics & Science Policy master's student

▶ Measuring the Well-Being of North Carolina's Youngest Residents

Launched in February 2019, the North Carolina Early Childhood Action Plan aims to ensure that by 2025, all young children in the state are healthy, safe, and ready to succeed in school. One of the plan's ten goals is to have **a reliable measure of social-emotional health**. For example, how well can young children regulate their emotions, follow directions, and express wishes?



The Bass Connections [NC Early Childhood Action Plan](#) team set out to understand how health systems across the country screen for social-emotional health and to determine best practices for measurement at the population level.

Community team members

included the North Carolina Department of Health and Human Services, the Durham County Department of Social Services and the Partnership for Children.

The team interviewed 37 experts from 19 states and 8 national organizations about efforts to monitor and collect data, the most promising policy levers, and the most vexing barriers to implementation. Drawing on their research and interview findings, **team members recommended an equity-based approach** that incorporates regular caregiver/child screening, data sharing, and improved strategies for patient follow-up.

Next steps include developing an implementation framework for social-emotional health measurement at the population level.



Our team's goal was to help the state answer questions about social-emotional screening at the population level. As co-project manager, I was intentional about letting the

undergraduates have a big say about how things were going to get done. We made decisions together.

NATHANIEL NEPTUNE | MD and MBA student

TEAM LEADERS

Rushina Cholera | School of Medicine

Elizabeth Gifford | Sanford School of Public Policy

KK Lam | Duke Clinical and Translational Science Institute

Gillian Sanders Schmidler | School of Medicine

RESEARCH CONTINUES THROUGH BASS CONNECTIONS

In 2020-2021, this work will advance through a Bass Connections project team, [North Carolina Early Childhood Action Plan: Evidence-based Policy Solutions](#). The team's research will focus on either the plan's Food Security goal, which aims to decrease the percentage of children living in food-insecure homes, or the Healthy Babies goal, which seeks to lower the infant mortality disparity ratio.



2020 Bass Connections Award for Outstanding Mentorship

This award recognizes the vital role graduate students and postdoctoral scholars play in mentoring students on Bass Connections project teams.

RECIPIENTS

JAIME CASTRELLON, Ph.D. student, Psychology & Neuroscience: Using Neuroscience to Optimize Digital Health Interventions across Adulthood

AMANDA LAZARUS, Ph.D. student, Art History: Building Duke: The Architectural History of Duke Campus from 1924 to the Present

FINALISTS

HAILEY BRIGHTON, postdoc, Orthopaedic Surgery: Bioremediation of Plastic Pollution to Conserve Marine Biodiversity

RUSHINA CHOLERA, postdoc, Pediatrics: NC Early Childhood Action Plan

NICOLE SANTEIRO, master's student, Public Policy: Collaborative Learning in STEM

Jaime was a great mentor. I came in knowing very little about neuroscience or how to do the work necessary for the project we were working on. He was patient with me and encouraged me to ask questions even if they were basic. He pushed me and my group outside of our comfort zone and prepared us well enough to present as the only undergraduates at a well-established conference. Most importantly, he gave us the skills we needed and made us feel confident enough in ourselves to represent and present on behalf of him.

UNDERGRADUATE TEAM MEMBER

During our first visit to the archives, some of the first- and second-year students were overwhelmed. Amanda immediately took note of the situation, and elaborated on points of confusion thoroughly, efficiently and respectfully. She contextualized the minutiae of the project within the larger research direction, while sharing her own challenges in her research experience. This attention to detail and level of care allowed her to earn deep and sustained trust with the team.

UNDERGRADUATE TEAM MEMBER

2020 Bass Connections Student Research Awards

Fourteen graduate students and ten undergraduates will pursue faculty-mentored research projects with grant funding from Bass Connections.

These projects explore a diverse range of topics, including mercury exposure in gold mining communities, biomedical device design and innovation, the relationship between urban greenspace and public health, digital mapping to remember the Middle Passage, and the bioremediation of plastic waste using a plastic-degrading enzyme, among others.

COLLABORATIVE PROJECTS

LEN ASSAKUL, PRATIK DOSHI, ANISH NIGADE and KELLY YANG

AUTUMN BARNES and KRYSTIN JONES

ISABEL BRADLEY, KELSEY DESIR, JANE HARWELL, TYE LANDELS-GRUENEWALD, ANYA LEWIS-MEEKS and PERRY SWEITZER

MATEO VILLAMIZAR CHAPARRO and HARLAN DOWNS-TEPPER

WENDY DONG, GEOVANNI JANER and RUOPU JIAO

NARISSA JIMENEZ-PETCHUMURUS, AMELIA MARTIN and HIWOT ZEWDIE

INDIVIDUAL PROJECTS

SARAH KWARTLER

GRACE LLEWELLYN

RESHMA NARGUND

PRIYA PARKASH

Although plastics were initially celebrated for their durability, the environmental and health risks from their use and accumulating waste are a growing concern. This research will elaborate on current attempts at editing the PETase gene to increase the number of mutants and determine what mutations improve PETase's ability to biodegrade plastic. Some of these mutants may create a more efficient version of PETase, allowing the enzyme to better degrade thick, crystalline PET. Considering the growing plastic epidemic, this novel methodology for improving biodegradation holds immense potential.

SARAH KWARTLER '21

HIGHLIGHTS FROM THE 2019-2020 PROGRAM EVALUATION

Faculty Research and Pedagogy

This year, we completed our first [long-term faculty impact survey](#) to assess the longer-term impact of the program on faculty. We found that Bass Connections has had a lasting impact on faculty research, pedagogy and relationships.

RESEARCH

- Faculty reported that Bass Connections teams played an important role in securing 40 grants totaling \$19.8 million.
- Half of the respondents reported at least one publication resulting from their team, with many noting multiple publications.

PEDAGOGY

- 67% of respondents agreed that Bass Connections made them a better teacher.
- 75% agreed that participating in Bass Connections improved their ability to organize and lead student teams.

EXTERNAL PARTNERSHIPS AND PUBLIC IMPACT

- 58% of respondents agreed that Bass Connections helped them connect their research to the external community.
- Many projects led to the development of new devices, apps, tools, policies, and practices that are being implemented to improve communities here in the Triangle and around the world.

STUDENT RELATIONSHIPS

- 82% of respondents indicated that they are still in contact with students who participated on their team.
- 80% agreed that the structure of Bass Connections helps faculty and students develop deeper and more lasting relationships than those that typically develop in the classroom.

The rich experience working with the graduate student program coordinator, my colleague, and the five undergraduate students — seeing that develop over time while working together on a shared and creative project — was the most meaningful. This is not an experience that I have had in a classroom environment or any other projects with colleagues.

TEAM LEADER



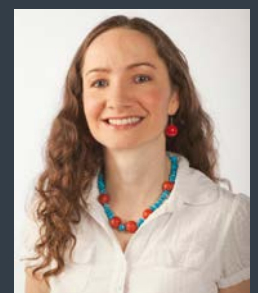
Receiving mentorship from a faculty member outside of my school [was especially meaningful]. We now have a continued mentorship relationship that I believe will expand beyond our Bass Connections time.

GRADUATE STUDENT TEAM MEMBER

RESEARCH CONTINUES THROUGH EXTERNAL GRANT

Dalia Patino-Echeverri (Nicholas School of the Environment) led a two-year Bass Connections project team to develop open source tools for modeling the integration of renewable energy systems into the conventional electricity infrastructure. These projects seeded larger-scale research efforts.

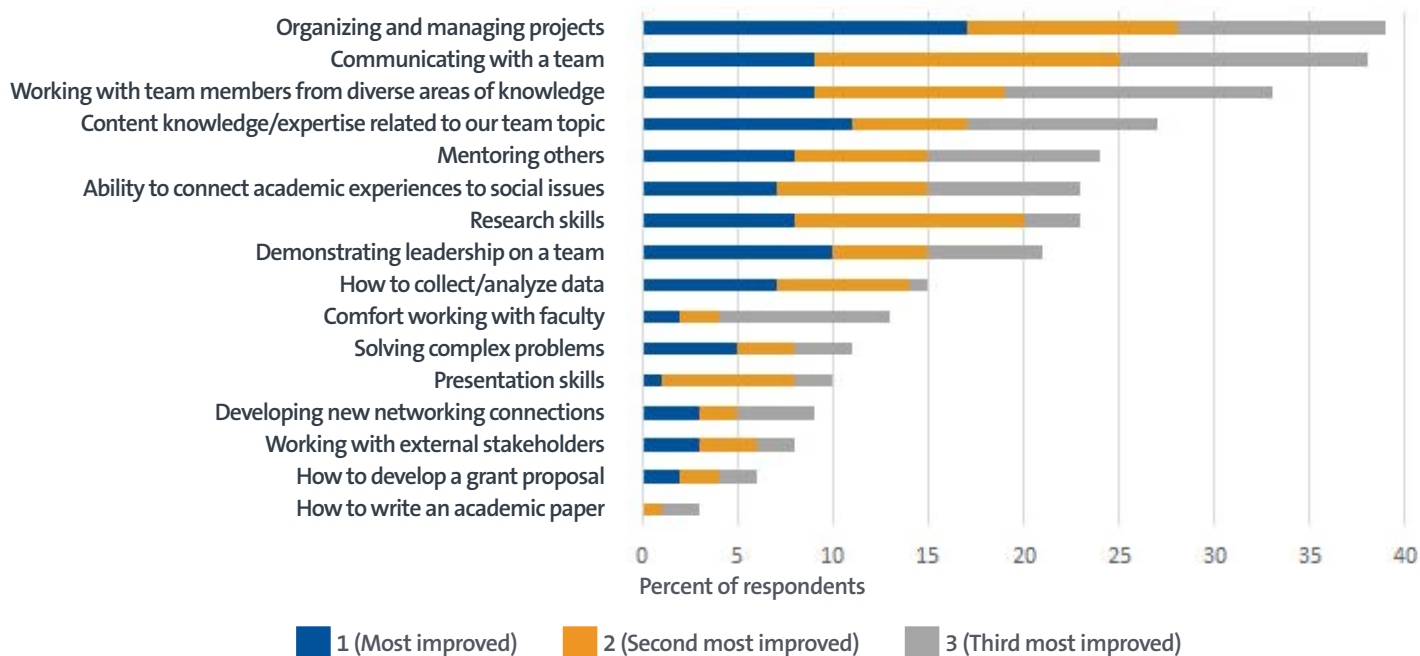
In 2020, the U.S. Department of Energy [awarded a \\$2.4 million grant](#) to Patino-Echeverri and her colleagues to further this research. Their project will help utilities and wholesale electricity markets improve their efficiency and reliability while reducing emissions and costs, at a time of needed transformations to tackle climate change.



Graduate Student Development

Graduate students reported that the program helped them develop a wide range of skills, particularly related to the ability to **manage complex projects and work within teams** – skills that equip students to make an impact across a variety of careers. To learn more, read the [evaluation report](#).

Please rank the top three skills that you believe you have most improved upon as a result of your participation in Bass Connections



WHAT GRADUATE STUDENTS ARE SAYING

I want to be a PI [principal investigator] in the future, so working as a team leader for our project was extremely useful for developing those project/grant management skills and recognizing the areas I still need to develop. I've learned a tremendous amount about how to manage a research project and mentor undergraduates, which will help me in every stage of my career.

The attribute I developed that will be most helpful for my future career is project management and leadership. Balancing multiple projects and objectives simultaneously has been a great experience, as well as communicating and directing these objectives to the members of my team.

My team had everything required for a team to be successful – members with diverse experiences, open culture and the right amount of guidance. I feel deeply connected to all my project members and team leaders, and this project became a critical part of my life in the past nine months. I look forward to having this experience one more time in my life!

I really enjoyed the interdisciplinary nature of Bass Connections. Working with undergrads, graduate students from different backgrounds, faculty and staff was incredibly rewarding. By establishing a baseline of equality, we were able to work cohesively without any power dynamics hindering our ability to participate in each discussion.

Undergraduate Student Development

Our assessment of undergraduate student growth this year (see the [report](#)) included a self-reported survey taken before and after students participated in Bass Connections project teams. Results were benchmarked against a comparison group of nonparticipating Duke students. **Bass Connections students reported improving on all 17 survey items**, with statistically significant gains noted for 11 of 17 items. Students in the comparison group did not report statistically significant gains on any of the 17 survey items.

Average gains reported by Bass Connections participants over the year



Asterisks denote the degree of statistical significance with three asterisks denoting the highest confidence level (* $p < .05$, ** $p < .01$, *** $p < .001$).

WHAT UNDERGRADUATES ARE SAYING

The most challenging aspect of my Bass Connections experience was learning how to navigate through the occasional ambiguity. Because it was not a traditional classroom format and structure, at times the students were in charge of deciding the next steps to take with our research. Although this was challenging, it was a significant part of our growth.

It was probably the first time I've had to try and answer questions no one else had the answers to, which meant I was also asking if I was even pursuing the right questions. It was an experience that was initially overwhelming and that I did not feel skilled enough for, but in the end, I grew both as a person and as a researcher.

I got to develop relationships with faculty that I wouldn't otherwise be able to interact with. They were all so passionate about the subject and fostered a strong team bond. My Bass Connections project has made me feel more strongly about integrating education and mentorship into my future career.

Bass Connections has truly made my Duke experience. I found a faculty mentor and two graduate student mentors that I can rely on. I found a lab that I love. Bass Connections gave me the knowledge and skills (as well as led me to my advisor) to do a senior thesis on a topic I am passionate about.

FUNDING

Bass Connections is made possible by more than 70 donors who have established 86 funds to support project teams, educational programming, faculty engagement, and linkages between Bass Connections and other university programs. Donor funds enable Bass Connections to introduce new program innovations and expand opportunities in an effort to meet student demand for team-based, applied research.

This year, with a [new gift](#) of \$5 million from the Mary Alice Fortin Foundation, we celebrated the fulfillment of the **Bass Connections Challenge Fund** – a matching fund of \$25 million established by Anne and Robert Bass to match every \$2 of new donor gifts with \$1. Added to \$1 million in prior giving from the Mary Alice Fortin Foundation, this **new gift created a \$9 million endowment** to support Bass Connections. In recognition of the gift, Duke's Board of Trustees renamed the program's annual culminating event [The Fortin Foundation Bass Connections Showcase](#).

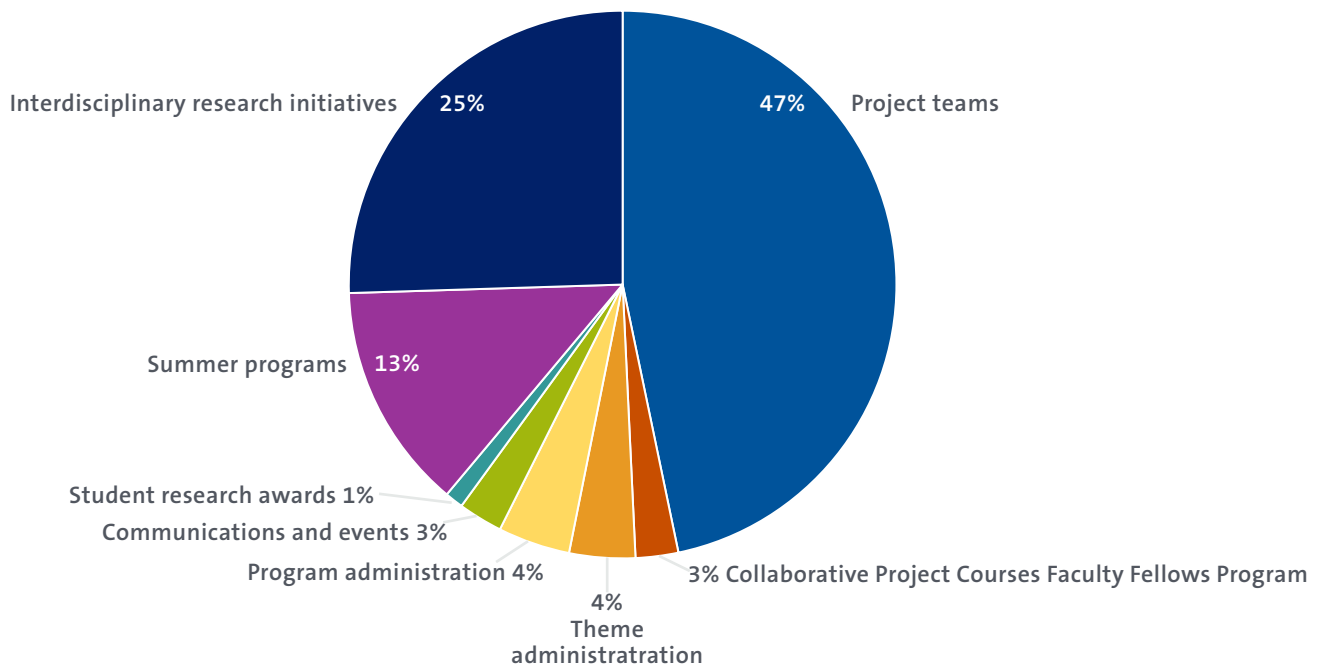
While attending the Bass Connections Showcase, what struck me most was the faculty engagement with students. Their reflections about how the program introduced both the faculty and students to new ways of addressing societal challenges reinforces the importance of investing in this significant program at Duke.

DANIELLE (DANI) MOORE T'85 | President, Mary Alice Fortin Foundation



Expenses

Core program expenses for Bass Connections in 2019-2020 totaled approximately \$3 million.



* Figures do not include affiliated gifts administered by schools such as faculty chairs or educational program funds. Summer program figures include funding provided through Bass Connections sources but do not represent the total cost of running affiliated summer programs.

THE FORTIN FOUNDATION BASS CONNECTIONS SHOWCASE

This year, amidst the COVID-19 pandemic, project teams drew on virtual means to share their research with the community. Students collaborated online to produce websites, videos, digital presentations, podcasts, lightning talks, profiles, and posters.

Explore the 2020 Fortin Foundation Bass Connections Virtual Showcase.



Bass Connections Award for Best Research Poster

WINNER

[Studying Malaria Transmission Patterns in the Amazon](#)

By Lissette Araya, Jonathan Avendano, Alex Bajana, Annika Gunderson, Olivia Hunt, Rani Kumar, Amelia Martin, Robert Rolfe Jr, Maria Velasco and Mackenzie Zepeda

RUNNERS-UP

[The Art and Craft of Saxophone Mouthpiece Design](#)

[Measuring and Addressing Social-Emotional Well-being in Early Childhood](#)

[Spreading HoPE](#)

2024 W. Main Street | Durham, NC 27705
BASSCONNECTIONS.DUKE.EDU
bassconnections@duke.edu
919-684-9021

