DISCOVER A SCHOOL
WITHOUT WALLS

Welcome

The digital revolution is as significant as the agricultural and industrial revolutions that came before, and it will transform how we work and live just as dramatically. Data is the fuel that will drive this transformation—and data science is the practice by which we can enact it in a responsible way.

Although data science is often called a new field, it can really only be considered so when we look at it in aggregate, for the components—statistics, computer science, and mathematics—have long existed. When they are applied together, to every imaginable discipline, we get something fresh and profound. Profound enough for the University of Virginia to create a new school, only the 12th in its 200-year history.

Our field may be nascent, but its potential for producing nefarious outcomes has already been well documented. We are committed to teaching and practicing responsible data science, with the common good in mind. As the first school of data science in the country, we have an obligation to be a leader in the field and in education. That leadership is built upon ethical partnership with all stakeholders, from schools and departments at UVA, to other universities worldwide, to the private sector, to government, to nonprofits, and to the general public. We strive to be a school without walls: an institution with collaboration at our core.

Data science is vital to understanding our world, and it is a discipline that belongs to all of us. As a school, we believe in that shared sense of responsibility. We are teaching the data scientists of the future to believe in it, too. When I look into their eyes upon graduation, I am filled with joy and hope for what they will accomplish.

Phil Bourne
*Founding and Stephenson Dean,
School of Data Science*
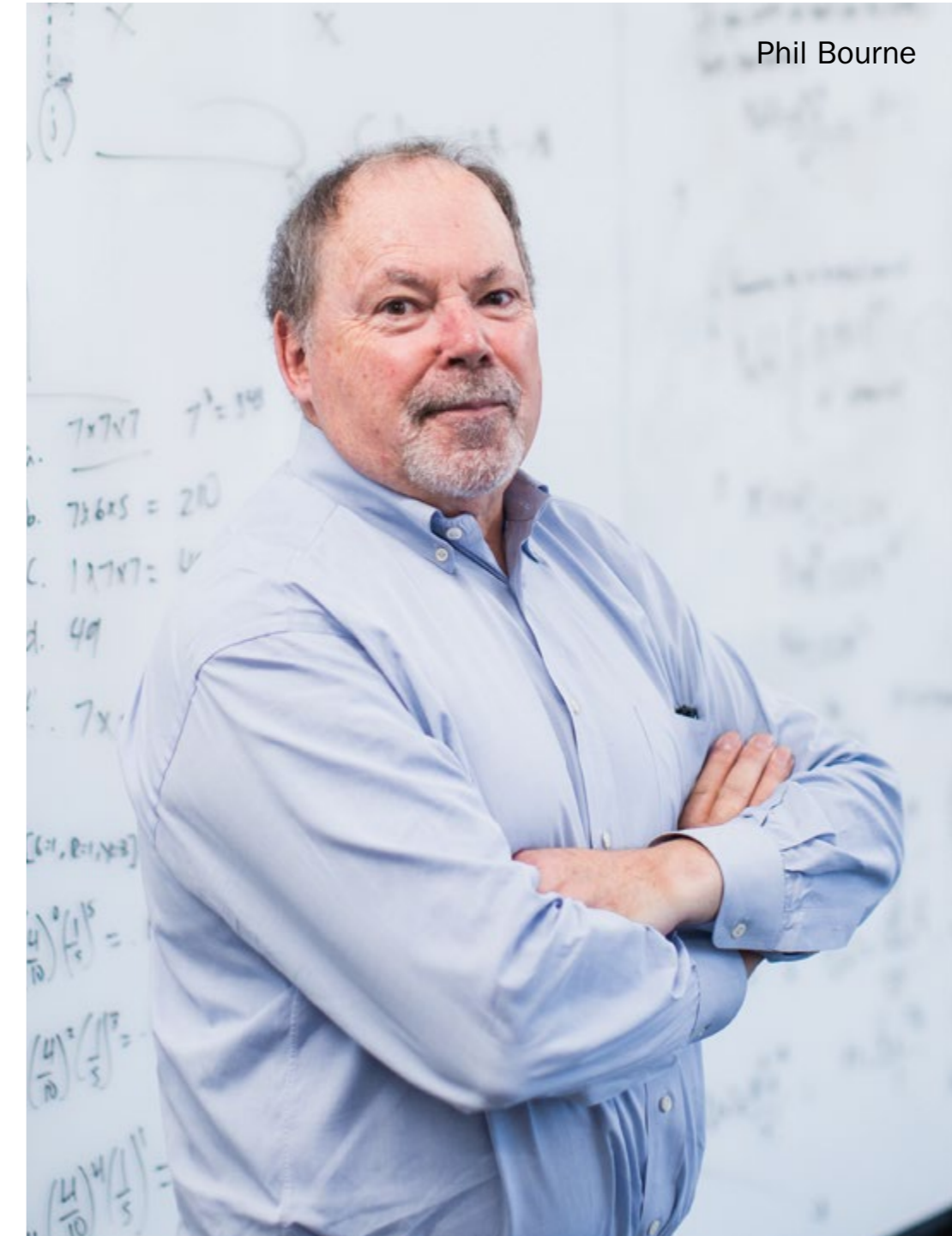
Phil Bourne

Discover the (1st) school of data science in the nation

There is an ever-increasing amount of data in the world — 90% of it has been created in the last two years*. At this moment in time, we have an unprecedented opportunity to quantify our world and transform it for the better.

Founded in 2019 through the largest gift in the history of the University of Virginia, the School of Data Science positions the university and our community to play a leading role in the global digital future.

Our Mission

CATALYZE discovery through leading edge, interdisciplinary research.

EDUCATE a diverse workforce to be responsible practitioners and leaders in an increasingly data-driven society.

SERVE our community, our nation, and our world by using data science to advance the common good.

*https://www.uschamberfoundation.org/bhq/big-data-and-what-it-means

Two Year Timeline

SEP. 2019
WE'RE OFFICIAL! The State Council of Higher Education for Virginia approves formation of the School of Data Science.

OCT. 2020
COLLABORATORY: SDS and School of Education launch the Collaboratory for the Advancement of Education and Data Science.

DATA ACTIVIST IN RESIDENCE: SDS hires first Data Activist in Residence.

DEC. 2020
FIRST GRADUATING CLASS: SDS graduates its first cohort of Online M.S. in Data Science students.

APR. 2021
$2 MILLION GIFT ANNOUNCED: Capital One's Center for Machine Learning gives $2 million to name the central hub of SDS's future building at the corner of Emmet and Ivy.

JUL. 2021
DIVERSITY, EQUITY, AND INCLUSION: SDS hires first Associate Dean of DEI.

SEP. 2021
FINANCIALLY SOUND: Total endowment valued at over $170M.

MAY 2020
DATA SCIENCE MINOR: UVA Faculty Senate approves undergraduate minor in data science.

JUN. 2020
NEED-BASED AID: SDS introduces need-based financial aid for M.S. in Data Science students.

PROFESSIONAL PROGRAM: SDS launches Data Science for Business Strategy Program with Darden School of Business and McIntire School of Commerce.

NOV. 2020
GIRLS WHO CODE: SDS sponsors first Hackathon for newly initiated UVA chapter of Girls Who Code.

MAR. 2021
PH.D. APPROVED BY BOV: UVA Board of Visitors approves resolution for a Ph.D. in Data Science.

MAY 2021
350+ ALUMNI: SDS graduates its 7th cohort of M.S. in Data Science students, surpassing 300 alumni.

JUN. 2021
HBCU SUMMER RESEARCH: SDS holds first Data Science for Health Equity HBCU summer research program, sponsored by Deloitte AI Institute for Government and Oracle for Research.

WOMEN IN DATA SCIENCE: SDS matriculates first M.S. in Data Science cohort with a female majority (52%).

AUG. 2021
WE'RE GROWING: Team passes 50 FTE's with the addition of 10 new faculty.

Contents

New School, New Space

Transcending Boundaries

We aim to be a school without walls, committed to innovation and collaboration, and our new building will reflect this philosophy. Open, collaborative spaces will transcend traditional boundaries and spark interdisciplinary connections between learners, researchers and innovators. The four-story facility will include adaptive classrooms, faculty offices, collaborative meeting spaces, and research areas. Public spaces will be open to the University and broader communities alike.

Partners

A transformative gift by the Charlottesville-based Quantitative Foundation has funded the building. In addition, Capital One's Center for Machine Learning recognized the current and future work of the School of Data Science with a $2 million gift naming the Capital One Hub.

New School, New Space

A Nexus of Discovery

Our new space will stand at a vital intersection for the University of Virginia, connecting Central Grounds with the athletics complex and fields, the Law School, and the Darden School of Business. A vibrant hub built to foster collaboration, the building will bring people together from across the University, the city of Charlottesville, and beyond.

By the Numbers

STORIES	SQUARE FEET	COLLABORATIVE WORK SPACES	CLASSROOMS FOR UP TO 45 PEOPLE
4	61,122	20	2

RECORDING STUDIOS	TOTAL CAPACITY	SUPPORT FROM CAPITAL ONE'S CENTER FOR MACHINE LEARNING	CLASSROOMS FOR UP TO 75 PEOPLE
2	1,873	$2M	2

▼ *MORE RENDERINGS OF OUR SPACE BELOW*

Responsible

With easy pedestrian and biking access, a stormwater retention pond, smart building technology, and other features, our new space will meet key sustainability goals.

Transparent

An open and airy layout will reflect the University of Virginia's original architectural vision: a space that fosters learning by creating ample opportunities for faculty and students to interact.

Collaborative Common areas such as the atrium, lobby, Corporate Commons, hardware lab, and fourth-floor terrace and reading room will serve as inviting hubs for the exchange of ideas and innovation.

Open

Large public spaces will create opportunities for engagement with the greater UVA, Charlottesville, and data science communities.
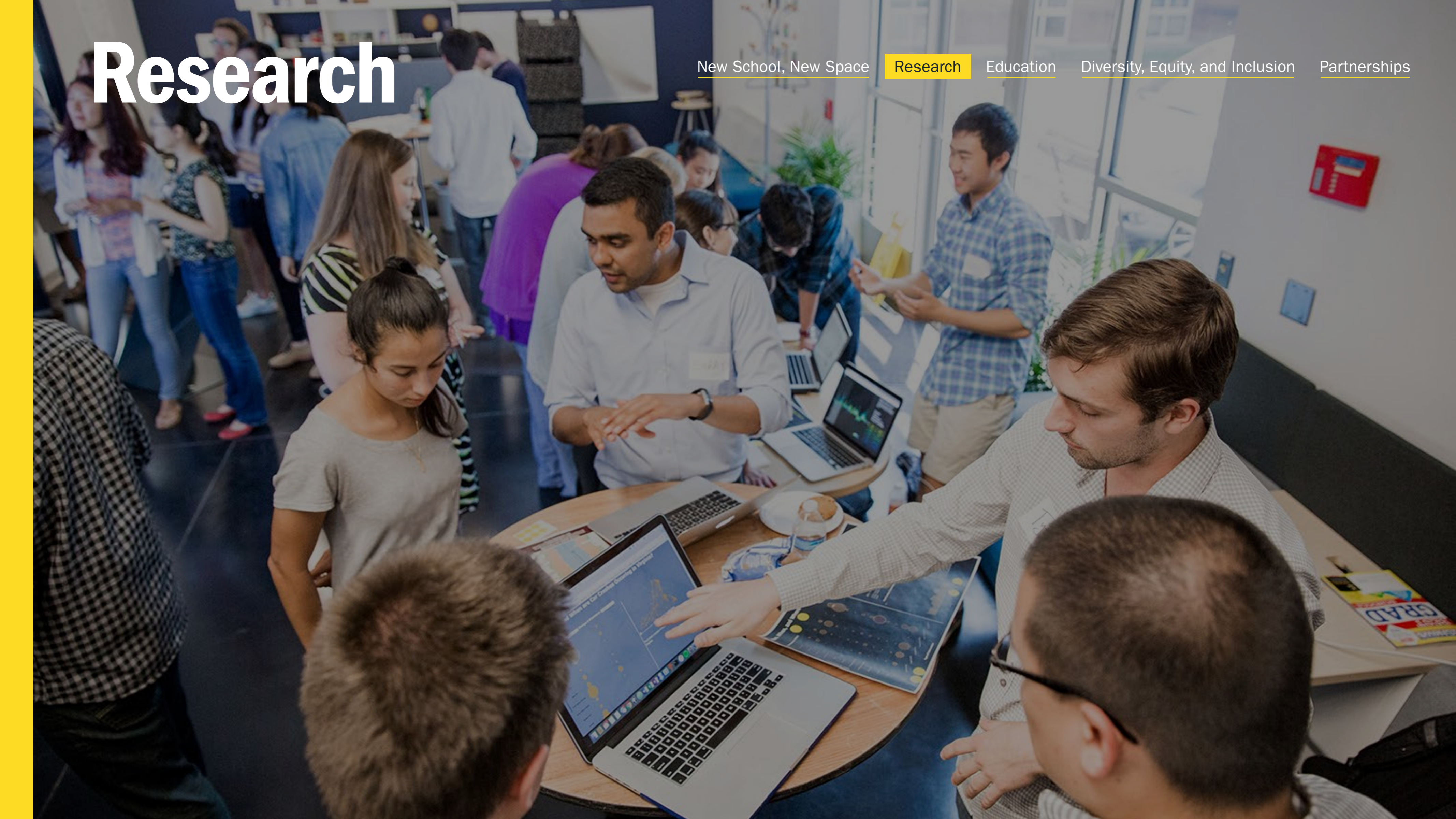
Research

Furthering Discovery

The School of Data Science pursues high-impact research to further discovery, share knowledge and transform society.

Through their research, our faculty and students are building a better world in a variety of ways.

DEMOCRACY
Investigating how terrorist groups recruit women through propaganda and examining risk for extremist violence.

EDUCATION
Helping economically disadvantaged, underrepresented populations pursue pathways that have a higher probability of leading them to success.

HEALTH & MEDICINE
Securing high-performance computing equipment and personnel to allow collaboration across the university on brain science research concerning autism and more.

CYBERSECURITY
Detecting broad-spectrum cyber threats almost immediately after they are launched—research made possible through a grant from the Department of Defense.

ENVIRONMENT
Using NASA data collected aboard the International Space Station to examine and develop responses to climate change in the Shenandoah National Forest and beyond.

BUSINESS
Discovering what makes a job interview successful for both the candidate and the recruiter and learning how to mitigate bias in the recruiting process.

Frankie Zeager, M.S. in Data Science 2017
Thumbtack, Data Scientist (Chicago, IL)

The Future of Discovery

We plan to expand and deepen our research through initiatives designed to foster innovation and collaboration.

Collaboratories

These cross-disciplinary research groups will use the power of data science to advance every field, creating a collaborative ecosystem of people, ideas, and infrastructure. Our inaugural Collaboratory is a partnership with the School of Education and Human Development and focuses on economic mobility, replication studies, and education technology.

Centers

These concentrated hubs will allow students and faculty to explore some of the most pressing challenges in our data-driven society through a clearly defined lens. Our inaugural Center is the Center for Data Ethics and Justice, which investigates a range of issues, including bias, inequality, and artificial intelligence.

RESEARCH PROJECT SPOTLIGHT

Strengthening Disaster Response

A team of researchers and practitioners uses space technology to help children in crisis.
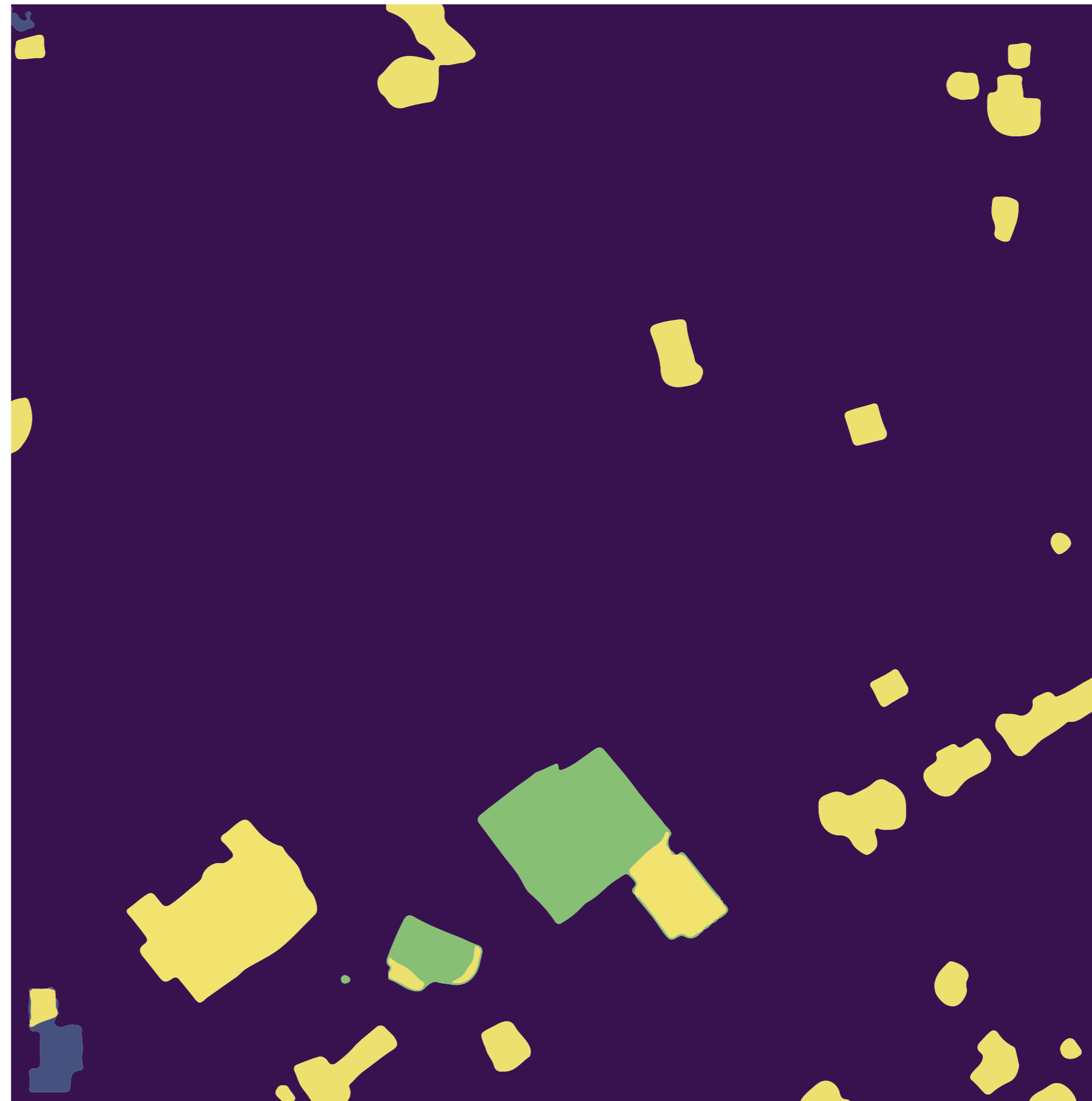
Code the team used to identify the degree of infrastructure damage through color, with blue indicating none, teal indicating minor damage, green indicating major damage, and yellow marking a structure as destroyed.

"The students wrote up very clear documentation—a step-by-step guide on how to use the code—with the idea that they can then package it as a software and give it to Save the Children."

— Bill Basener, Professor of Data Science

Background

When disaster strikes—whether it's an earthquake or an armed conflict—Save the Children needs to move quickly. The humanitarian organization aims to provide families who are migrating in the wake of a crisis with food, water, shelter, and other vital resources. A team of student and faculty researchers from the School of Data Science wanted to help.

Methods

"One of the main ways to predict if there's going to be a migration after a crisis is if the infrastructure in a place has been damaged," says Assistant Professor of Data Science Jon Kropko. "So in a city where a lot of the houses have been destroyed, and a lot of the roads and bridges, there's a much higher probability of a migration coming from that spot. Knowing that probability can help Save the Children spring into action." The team wanted to see if they could make those predictions by running new data with an existing code that was created to identify damaged infrastructure using satellite imagery as part of IBM's xView2 AI Challenge.

Results

Although the code was complicated and "data greedy," Kropko said, the team found a way to make it work. "The students wrote up very clear documentation as well—a step-by-step guide on how to use the code—with the idea that they can then package it as a software and give it to Save the Children," says School of Data Science professor Bill Basener. The team also connected the nonprofit with the space technology company Maxar, which can provide a regular stream of satellite imagery for the software to use.

Impact

The results illustrate the importance of collaboration, the researchers say. "It's easy for data scientists to think we can save the world without actually working with anybody," says Kropko. "Instead, we need to incorporate quantitative data tools into the arsenals of the groups that are already doing the work. Save the Children has plenty of experience solving these very important issues of migration. We're just assisting them in their mission."

Understanding Health Inequities

A team of student researchers takes a deep, narrow dive into one of the medical field's toughest problems

▼ A graph the team created breaks down the number of comorbidities in COVID patients by race and ethnicity.

Background

"We know health inequity is an issue. The pandemic has made that clear," says Ethan Assefa, a recent University of Virginia graduate who has begun his Master of Public Health at Boston University. "Now we need to better understand how widespread it is, so that we can take steps from there."

As part of the School of Data Science's UVA-HBCU Bridge to Summer Research Data Science Program, Assefa and four other undergraduates—Suliah Apatira, Esau Hutcherson, Rehan Javaid, and Dahnielle Milton—worked closely with School of Data Science professors. Deloitte AI Institute for Government and Oracle for Research funded their efforts. Assefa and his fellow researchers, who are students at UVA, Spelman College, and Howard University, wanted to know the answer to a specific question: Are patients with both COVID-19 and ischemic stroke receiving equal medical care, regardless of their demographics?

Methods

Looking at equity variables such as race, age, and socioeconomic status, the team analyzed a data set taken from the National COVID Cohort Collaborative, which houses information for more than 6.4 million patients.

Results

The results didn't answer the team's question as straightforwardly as they hoped, highlighting the need for further research. But a pattern did emerge when the team looked at a related aspect of the data: patient comorbidities such as diabetes, obesity, and chronic heart failure. African American patients had the highest number of these, followed by Hispanic patients. "That tells a clear story," Assefa says. "Comorbidities do not develop overnight. Looking at these numbers, you can see how environmental racism and structural racism play a role even in our health."

Impact

The team's findings on comorbidities, as well as future research into health equity for people with concurrent COVID and stroke, could have important real-world applications, notes Assefa. "Healthcare systems need to know what the situation is," he says. "I hope that in the future, data like ours can help them see where certain groups are not receiving the same level of treatment, and maybe lead to the development of programs that will make our medical professionals more aware."

Education
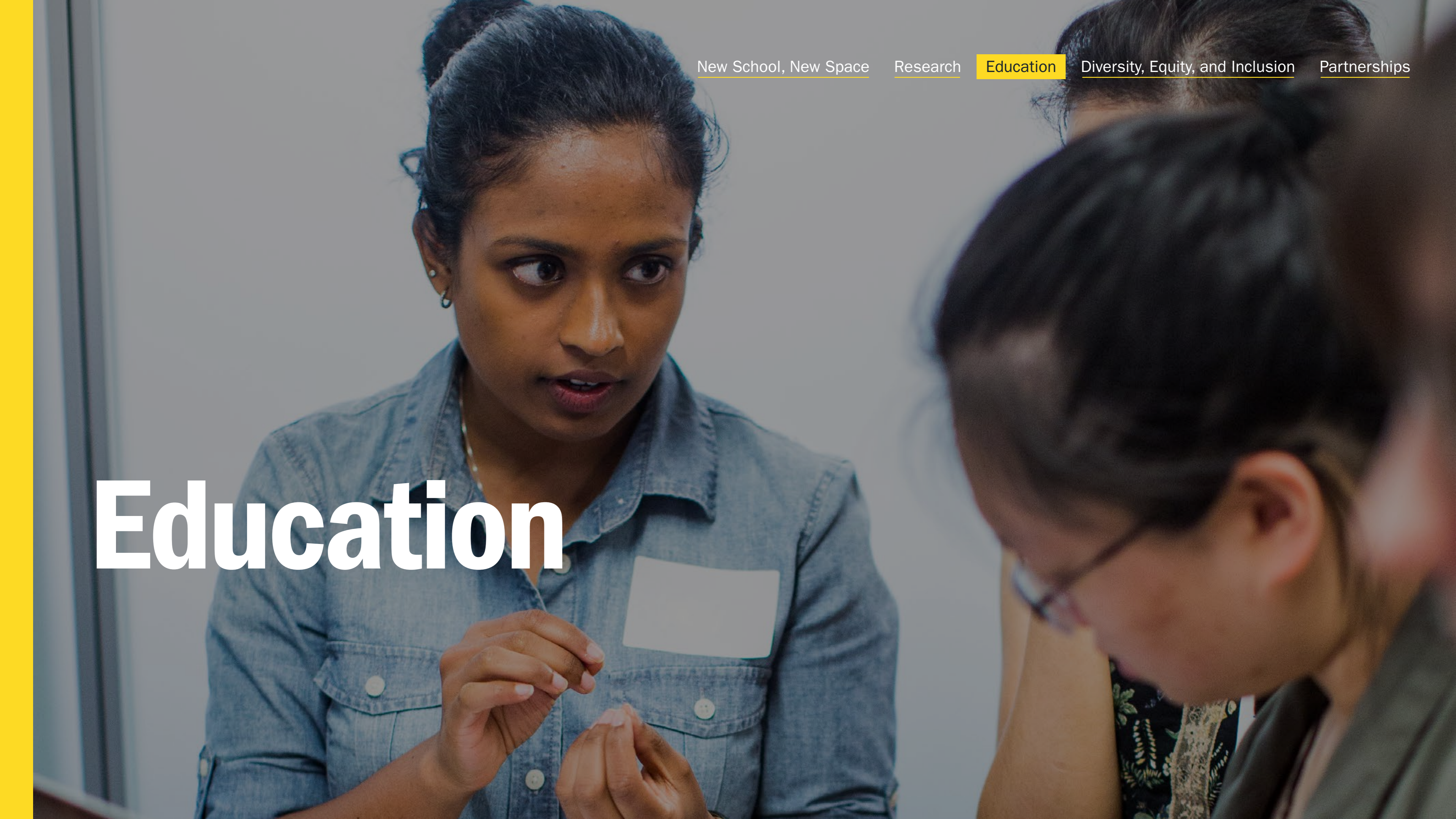
Fostering Explorers

Data scientist is one of the top three fastest growing jobs, according to LinkedIn's *Emerging Jobs Report**. By working with experts in diverse domains, applying data science to real-world issues, and learning both the practical application of data science and the principles behind it, our students are poised to become leaders and pioneers in the field.

Our goal is to educate students in data science throughout their academic journey and as lifelong learners, from undergraduate to professional.

Degree Programs

We offer residential and online M.S. in Data Science programs, as well as interdisciplinary dual degrees. A Minor in Data Science is also offered for undergraduate students, as well as a suite of non-degree programs for working professionals.

Degrees and Programs Available
M.S. in Data Science
Online M.S. in Data Science
Dual Degrees
Minor in Data Science
Professional Programs (Non-Degree)

Career Services
We offer extensive career support to students, including one-on-one career coaching, in-person and virtual workshops and events throughout the school year and summer, and engagement with industry professionals through technical talks and panels.

Professional Programs
We provide numerous executive education opportunities to industry leaders and professionals in a broad range of fields. Options include credit and noncredit, customizable content, flexible formats and varied learning environments.

Current areas of focus include deep learning, data for business strategy, navigating the path from data to policy and more.

UVA School of Data Science graduates are sought after by employers and add immediate value to their company and clients. They bring a unique set of skills, from data engineering and integration, to data modeling and visualization, to data analysis and reporting. M.S. in Data Science alumni are taught the value of responsible data science in practice through a rigorous master's program with a focus on cultivating collaboration, integrity, knowledge, and curiosity.

M.S. in Data Science
Typical Class Profile

The M.S. in Data Science is a residential, cohort-based program designed for high-achieving students interested in data science. Here is a typical class profile averaging the demographics of the last three classes.

CLASS SIZE	53
AVERAGE GPA	3.4
AVERAGE YEARS WORKED	1-3
FEMALE	48%
MALE	52%
INTERNATIONAL	25%
UNDERREPRESENTED	8%
MILITARY/VETERAN	4%
UVA UNDERGRADUATE	52%

Online M.S. in Data Science
Typical Class Profile

The Online M.S. in Data Science is a cohort-based, five-term program designed for high-achieving students interested in data science. Here is a typical class profile averaging the demographics of the last three classes.

CLASS SIZE	26
AVERAGE GPA	3.48
AVERAGE YEARS WORKED	5
FEMALE	38%
MALE	62%
INTERNATIONAL	10%
UNDERREPRESENTED	13%
MILITARY/VETERAN	1%
UVA UNDERGRADUATE	40%

EMPLOYMENT STATISTICS

86% 9% $87,000

EMPLOYED | POST-GRAD INTERNSHIPS | AVG. BASE STARTING SALARY

SAMPLE JOB TITLES

Associate
Consultant
Data Analyst
Data Engineer
Data Science Associate
Data Scientist
Deployment Strategist
Director of Data Science
Engagement Manager
Financial Engineering
Junior Data Analyst
Machine Learning Consultant
Machine Learning Engineer
Modeling & Simulation Specialist
Product Data Analyst
Research Associate
Research Data Engineer
Senior Associate Data Scientist
Senior Statistician
Systems Engineer

SAMPLE HIRING COMPANIES

Amazon	Green Bay Packers	Notch
APT	Health IQ	Opex Analytics
Argus	Human Geo	Palantir
Bain & Company	IBM	Procter & Gamble
Booz Allen Hamilton	Kaleo	PwC
Capital One	KPMG	RedHat
CCRi	LMI	Riskspan
Chewy	Merkle	RS Energy
ComScore	Metis Machine	S&P Global Market
Deloitte	MITRE	Intelligence
Department of Defense	National Institutes	Springbok
EY	of Health	Thomson Reuters
Fannie Mae	Nielsen	U.S. Bank
Global Risk Intelligence	Northrop Grumman	Verisk Analytics

* based on 83% reporting, MSDS Class of 2020

INTERVIEW

Think Less Like a Human

A conversation with Matthew Thomas (M.S. in Data Science 2020)

Matthew Thomas

Matthew Thomas received his M.S. from the School of Data Science in 2020. Today, he works as a data scientist for Inclusively, a startup that connects job seekers who have disabilities with inclusive employers. Thomas spoke with us about what it's like to design job-matching AI that gives all applicants a fair chance.

What makes the AI you design more inclusive?
Companies want AI software that will send them the best people. The problem is, a lot of job-matching

software has biases towards many different demographics, and one of them is people with disabilities. The AI that I design still looks at skills and other qualifications that applicants have, like other job-matching software does, but it's from the perspective of lifting people up and paying attention to the parts that matter, rather than saying, "Let's try to weed out as many people as we can."

How do you avoid unfairly weeding people out?
I've learned a lot from conferences

where people with disabilities share their biggest roadblocks. For example, a lot of job-matching AI will weed out people who have gaps in their resume. If you're disabled, you're more likely to have those gaps, but not necessarily for a reason that would make an employer not want to hire you.

I also try to create AI that doesn't act like an HR department. It's easy to think, "Don't we want the AI to do what a human can do? Isn't that the whole point of automating it?" Well, not necessarily. You want it to do a task that a

human is doing, yes. But you don't necessarily want it to go about that task in the same way.

So how do you think less like a human?
A lot of it has to do with not inadvertently putting your biases onto the AI. Some years ago, people at a large tech company designed a software that took the resumes of people who had been successful there and looked for applicants with similar qualifications. It makes sense from a human perspective, but the AI just ended up confirming existing biases. If your workforce is more male than female, which was the case then among the engineers at the company, then that kind of AI is going to pick up on subtleties in resumes that identify people as female and weed them out, because that is how deep learning works. It can find things that humans can't find.

What insights from your time at the School of Data Science have stuck with you?
People often come to AI with good intentions, but it can morph into something that ends up having negative effects, like facial recognition technology or crime-fighting technology. In my classes at the School of Data Science, we talked a lot about how you have to be vigilant and consider long-term repercussions. That mindset has certainly helped me with what I'm doing right now, especially when I think about avoiding certain biases. I don't try to focus on getting something up and working right this minute. Instead, I think about building something that will last—and about how it's going to look five or 10 years from now."

> "In my classes at the School of Data Science, we talked a lot about how you have to be vigilant and consider long-term repercussions. That mindset has certainly helped me with what I'm doing right now, especially when I think about avoiding certain biases."

— Matthew Thomas

Diversity, Equity, and Inclusion

Championing Equity

Our society faces immense challenges related to the COVID-19 pandemic, systemic racism, and broad economic uncertainty. At the School of Data Science, our mission remains clear. From our inception, we have sought to center ethics, inclusion, and transparency in all we do. The urgent challenges of this moment have prompted our school to accelerate and reallocate our resources and efforts in this area.

Data can uncover systemic inequities and injustices—yet our field cannot solve these issues without diverse voices. We recognize that like institutions everywhere, we still have much room for growth in this area, and we welcome new partnerships that share our vision of equity and innovation.

CREATING DIVERSE PROGRAM PIPELINES

Although we have made some progress in the diversity of our students, we still have far to go when it comes to our faculty. In addition to partnering with K-12 schools to ensure a diverse candidate pool, we are building relationships with minority-serving institutions to attract diverse graduate students and prospective faculty. We are also increasing our presence at conferences and professional associations focused on serving underrepresented communities.

FOSTERING INCLUSIVE EXCELLENCE

Working with the UVA Alumni Association, we have established merit-based fellowships to support minority students. The first merit-based M.S. in Data Science Graduate Fellowship for Inclusive Excellence will be awarded annually to an incoming underrepresented graduate student of color or first-generation female whose application demonstrates academic merit, leadership potential, and a passion for data. We are also committed to supporting research projects that focus on diversity, equity, and inclusion.

WELCOMING TOP TALENT

Siri Russell recently joined the School of Data Science as the Associate Dean of Diversity, Equity, and Inclusion after having established a highly functional DEI office to serve the many branches of local government in Albemarle County, where the University of Virginia resides. Renée Cummings has also joined us as the inaugural Data Activist in Residence. She specializes in implicit bias, artificial intelligence ethics, and best-practice criminal justice.

Siri Russell

Beyond Rocket Science

A conversation with Siri Russell, Associate Dean of Diversity, Equity, and Inclusion

The former inaugural director of diversity, equity, and inclusion for Albemarle County in Virginia, Siri Russell became the new associate dean of DEI for the School of Data Science in the summer of 2021. Here, she shares the core values and persistent questions that shape her approach to increasing and supporting diversity, equity, and inclusion.

On why DEI work is nothing like building a rocket
I once heard [an equity officer say] that DEI isn't rocket science. When we say that, we don't mean

that it's not complex. You and I could go out right now and build a rocket ship. If we had the money, if we hired people with the right skills, we could follow certain steps—in other words, there's a blueprint for building a rocket ship and getting to the moon. But there's no blueprint yet for achieving equity in a system. We don't have a lot of really successful examples, whether it's in a higher education system, a housing system, or a food system. So we have to be really innovative and in tune with our context.

On "I" vs. "we"
A lot of people want to know what would bring me from a local government position—a really community-oriented, human-centered position—into a school of data science at a higher ed institution. A great deal of it was faith that this is a school that means to make good on its mission. Two of the school's central tenets are collaboration and using data science for societal well-being. Diversity,

equity, and inclusion work is central to being able to accomplish those things. One of my favorite quotes, which is often attributed to Malcom X, is "When 'I' becomes 'we,' even illness becomes wellness." When I think about collaboration, that is what I'm thinking about. How do we go from the "I"—even the "I" of "institution"—into the "we" of greater community?

**On why we need transparency—
even when it's painful**
We are being honest about where we haven't had success. Diversity in data science is a real issue, and our school is not an exception to that. Doing this work well requires transparency, and we know we need to be transparent to the point of pain. If everything you put forward is your hype song, you're not holding your organization accountable in an authentic way—a way that engenders trust. The folks who are really, truly engaged in doing the work for public good, the work for equity, the work

for diversity—those folks are looking for allies and partners, and allies and partners can only be found in honesty and vulnerability. We are just as bad as everybody else. That's not a thing to be proud of, but we also can't run away from that. This school is trying to do the work to be better. We call ourselves the school without walls, and we're trying to actively connect to a larger community that we look to for partnership—but also to keep us accountable.

On the power of innovation
I think the heart of this school has been turned towards diversity, equity and inclusion for a long time. This is a school of firsts, a school for explorers who aren't chained to the status quo or to how things have always been. There's an innovation engine here. I think that's important to highlight. To actually operationalize diversity, equity, and inclusion and really saturate the school with those values, we have to be different than anything that's come before.

Transforming Society
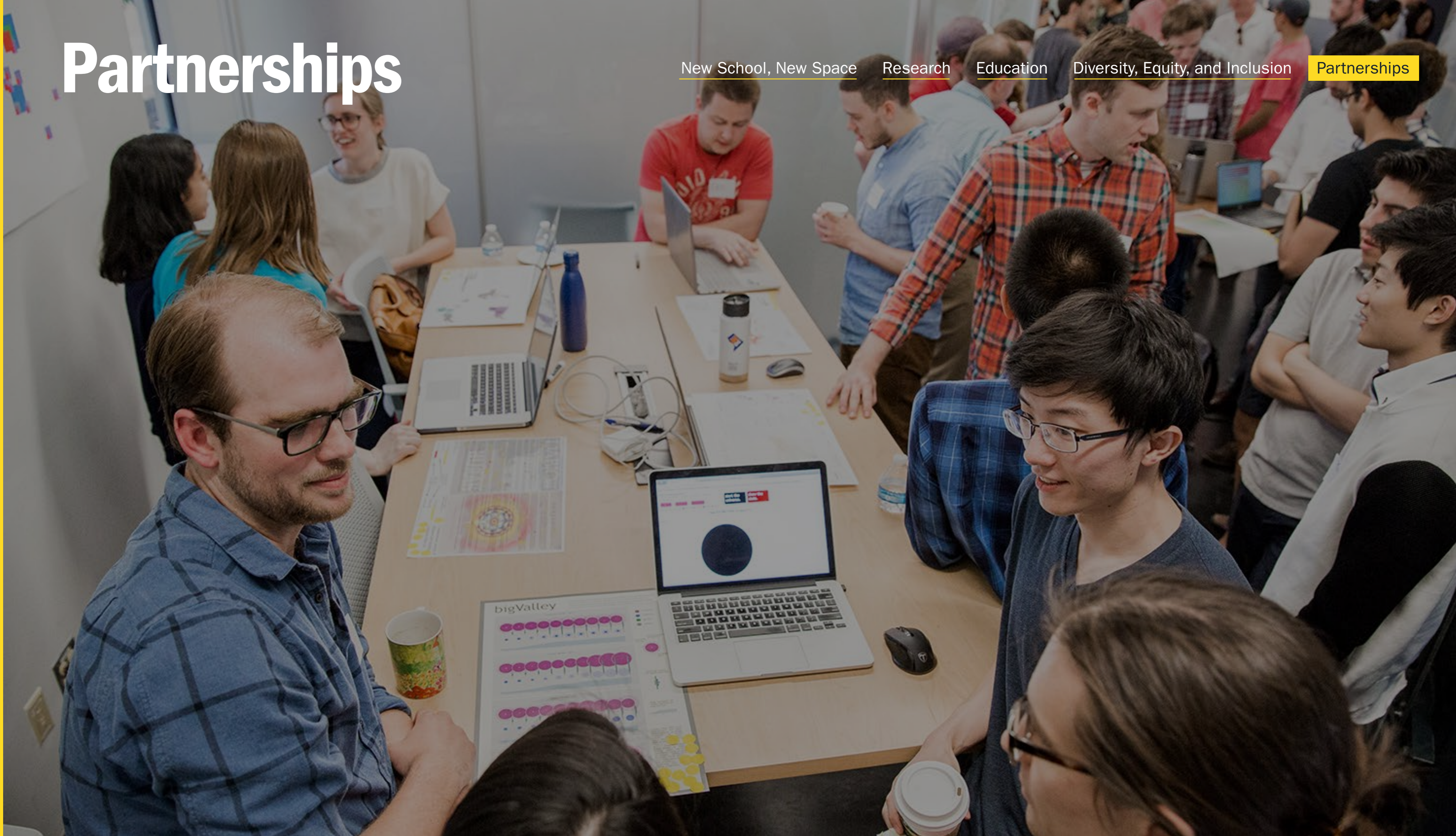
Data is changing the way we do everything. Researchers at the School of Data Science have used data from hospital monitors to better treat patients, credit card data to prevent fraud, and transportation data to reduce accidents. All of this requires cutting-edge knowledge of data science tools and techniques, as well as the ability to put them into practice. That's why we collaborate with community, industry, and government organizations to connect our work with theirs.

Partnership Opportunities

Scholarships. Faculty research projects. Recruiting and mentorship. New initiatives, like our HBCU Bridge to UVA Data Science program, which convenes minority students and researchers to address health equity. New spaces, like our Open Lab, a center for hands-on experience with free and open-source technologies.

We have a wide range of partnership opportunities—visit our website to learn more.

Here are a few of our current partners:

GOVERNMENT	COMMUNITY	INDUSTRY			
NASA	Metropolitan Museum of Art	Capital One	IBM	Microsoft Azure	QIM
U.S. Army	University of Virginia Health System	Deloitte AI Institute	LMI	S&P Global	
U.S. Navy	Wikipedia Foundation	for Government	Maxar	Oracle for Research	

Capital One

A data science company meets a data science school

"Data science and data analytics have always been core to Capital One's DNA, and we've been proud to support the growth of data science talent through our partnership with the University of Virginia. UVA approaches data science with a true understanding of how interdisciplinary this work is."

— Rob Alexander, Chief Information Officer, Capital One

Partner Mission

Capital One was founded on the belief that the banking industry would be revolutionized by information and technology, beginning with credit cards. The company is on a mission to bring humanity, ingenuity, and simplicity to banking.

Partnership Impact

In April 2021, Capital One's Center for Machine Learning gave $2 million to name the central hub for the School of Data Science's new building. As a prime gathering place for learning, sharing ideas, research, teaching, and community interaction, the hub will promote opportunities for discovery across the University of Virginia and the city of Charlottesville.

"The Capital One Hub will be a public space available not just for UVA students, faculty, and alumni, but also for the greater Charlottesville community and beyond," says Dean Bourne. "In that space, we'll be able to hold a range of events which, by welcoming the wider community, reach far beyond the school itself."

As one of our founding corporate partners, Capital One has collaborated with the School of Data Science since its inception, making the company's support of our new building especially meaningful. The company partners with the School of Data Science in an array of other important ways by:

• Providing career mentors to our students

• Participating in our speaker series

• Funding graduate capstone research projects, which challenge students to acquire and analyze data to solve real-world problems

• Sponsoring Datapalooza, an annual event that showcases research and industry trends across the University of Virginia and the greater data science community

• Sponsoring Women in Data Science, an independent event we organize to coincide with the annual Global Women in Data Science Conference held at Stanford University.

Datapalooza
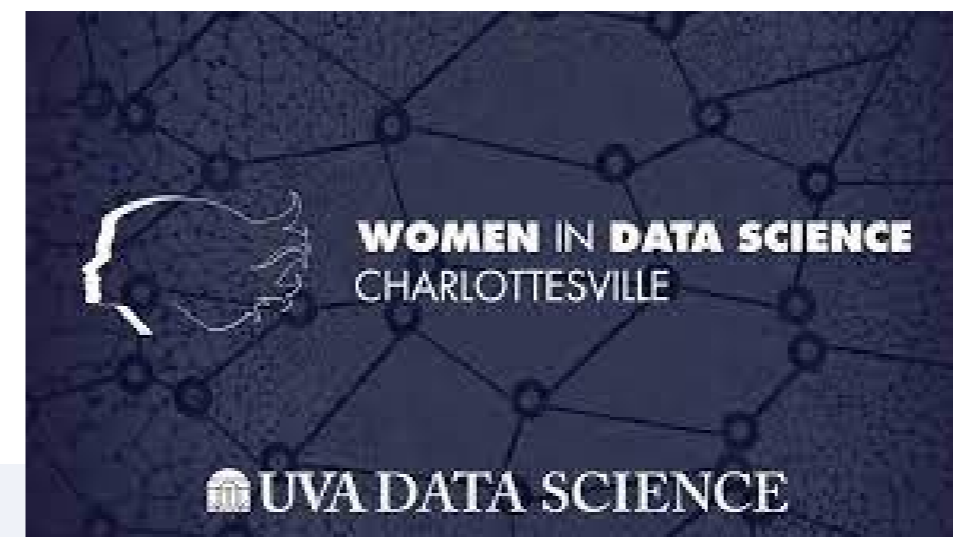
Kerry Jones, M.S. in Data Science 2017
Data Machines Corporation, Machine
Learning Engineer (Washington, DC)

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datascience.virginia.edu