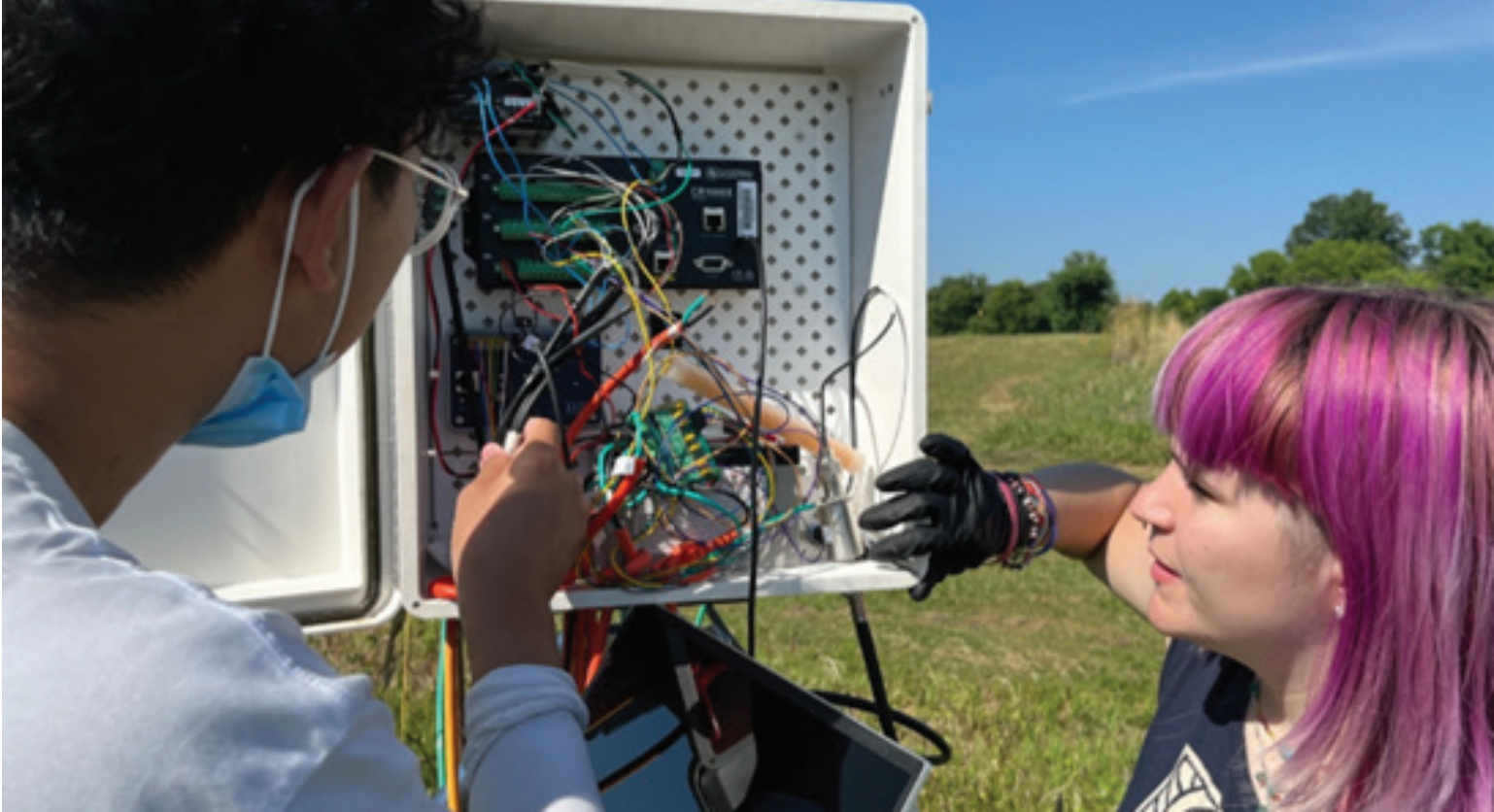




Thought For Food

The **Cornell Institute for Digital Agriculture (CIDA)** community is a dynamic ecosystem of scholars, teachers, and practitioners. Through seed grants, collaborations, education, and outreach, our members seek to drive agriculture innovation and tackle social, economic, policy, and environmental challenges at scale.

Asst. Professor of grape pathology Katie Gold and field research manager Dave Combs



M.S. student Zihao Zhang (left) and undergraduate student Sofia Echavarria working with the installation and programming of sensors and actuators at a field site.

Executive Summary

As a global leader in digital agriculture research, the Cornell Institute for Digital Agriculture is a dynamic community of researchers, farmers, industry partners, and other stakeholders working to provide equitable, sustainable, and efficient solutions to the most significant challenges of our time—from protecting the environment and improving livelihoods to feeding billions of people across the globe. We do so through research involving advanced and emerging technologies such as robotics, drones, sensors, networks, and artificial intelligence-based computer vision.

Our seed funding, letters of support, and community networking events have given life to new digital agriculture research ideas and projects, contributing to the generation of over \$100 million in external funding. Cornell is the only Ivy League and Land-Grant university with a strong mission to educate and support agricultural communities. Supported by the College of Agriculture and Life Sciences, the College of Engineering, the Bowers College of Computing and Information Science, and the College of Veterinary Medicine, CIDA fulfills this mission by envisioning and celebrating truly multi-disciplinary and trans-disciplinary solutions. The combined passions and talents of our world-renowned researchers manifest in transformational knowledge and technologies, while our collaboration, education, and outreach activities nurture a new generation of leaders poised to help farmers, farm communities, and all of us.

LEADERSHIP

Diane Bailey, Director

College of Agriculture and Life Sciences

Julio Giordano, Associate Director

College of Agriculture and Life Sciences

Renata Ivanek, Associate Director

College of Veterinary Medicine

Fengqi You, Associate Director

College of Engineering

Hakim Weatherspoon, Associate DirectorBowers College of Computing and
Information Science**Gabriela Cestero, Managing Director**

MSI External Relations

Eslie Medallon, Administrative Assistant

Students from across the university race the clock, collaborating to solve DA challenges at our annual Hackathon.



Electrical and computing engineering doctoral student Jonathan Jaramillo presents his research at the annual CIDA workshop.

EXECUTIVE COMMITTEE

Samuel Alcaine

College of Agriculture and Life Sciences

Parminder Basran

College of Veterinary Medicine

Chris De Sa

Bowers College of Computing and Information Science

Katie Gold

College of Agriculture and Life Sciences

Steven Jackson

Bowers College of Computing and Information Science

Yu Jiang

College of Agriculture and Life Sciences

Ed Mabaya

College of Agriculture and Life Sciences

Susan McCouch

College of Agriculture and Life Sciences

Tapan Parikh

Cornell Tech

Kirstin Petersen

College of Engineering

Ying Sun

College of Agriculture and Life Sciences

Steven Wolf

College of Agriculture and Life Sciences

Dominic Woolf

College of Agriculture and Life Sciences

Education Update

CIDA is dedicated to providing educational opportunities in digital agriculture. In 2022, we launched a digital agriculture minor with a brand-new introductory course featuring guest lectures from across our CIDA community. With over 30 students enrolled in the inaugural course, we took the class on two field trips to local crops farms, dairy farms, and the Geneva Agritech campus where local farmers and CIDA members provided demonstrations and answered questions.

In addition, we awarded over \$100,000 in summer Research Innovation Funding (RIF) to six undergraduate and eight graduate students. Each student worked with two faculty researchers spanning two of the four colleges that support CIDA. Students presented their results through posters or talks at our annual workshop in November.

We also hosted our annual student hackathon in February. A surprise heavy snowfall did not keep our students as well as industry and faculty mentors and judges from attending, with more than 100 students participating across more than a dozen teams to compete for prizes.

Congratulations to the 2022 CIDA Hackathon Winners:

Grand prize: *“Connecting Ghanaian cacao farmers with transporters and vendors for the benefit of all parties.”* Lukas Bredo Gundersen, M.S. '22, economics; Melissa Ginaldi '22, computer science; Ravipratap Misra, M.Eng. '22, engineering management; Ryan Dennis '22, computer science; Ying Zuo, M. Eng '22, engineering management and Samuel Meisner '24, information science.

Most Novel: *“Harnessing bee power with technology to provide precision pollination as a service.”* Angela Zou, M.Eng. '22, electrical and computer engineering; Ashwin Sivanadiyan, MBA '23; Chenghui Li, M.Eng. '23, electrical and computer engineering; Owen Deng, M.Eng. '22, electrical and computer engineering; Shiang Chin, doctoral student, systems engineering; and Yajing Wang, M.Eng. '22, engineering management.

Best Use of Data: *“Cloud solution to enable dairy farms to be efficient and smart with water resource usage and milk production.”* Aixuan Shan, M.P.S. '22; Alexander Dawson '22, animal science; David Needles '23, computer science; Hao Zhen, M.Eng. '23, engineering management; Jiaqi Wang, M.P.S. '22; and Yuexing Hao, doctoral student, human behavior design.

Most Potential for Market: *“A digital process optimization tool that helps restaurants reduce their waste with a unique twist.”* Abhishek Doppalapudi, M.Eng. '22, engineering management; Aditya Ravi, M.Eng. '22, engineering management; Homari Aoki, M.P.S. '22; Nishchay Selot, M.Eng. '22, engineering management; Zhixin Wang, doctoral student, food science.

Addressing a Grand Societal Challenge: *“User-first grocery tracking and storage monitoring platform, forging connections to prevent food waste, ensure quality and health.”* Ariel Yan, MBA '23; Connor Bohnen, MBA '22; Emma Conover, MBA '23; Kate Harline, doctoral student, plant biology; Lingjia Li, M.P.S. '22; and Polly Zou, MBA '23.



Show and tell: Ertai Liu, a Ph.D. student in the lab of Yu Jiang (robotics professor), introduces students from the 'Intro to DA' course to Jiang's field robots.



Spotlight: Somil Aggarwal

Computer science undergraduate Somil Aggarwal has been a stellar student member of CIDA. Two years ago, he competed with a team in our student hackathon. This past year, he was one of our six undergraduates to receive RIF funding, and he presented his findings to our community at our November workshop. He used his RIF funding to travel to Kenya, where he studied the entrepreneurial space in digital agriculture innovation. Professors Ed Mabaya and Hakim Weatherspoon served as his faculty mentors on that project. Somil graduated in December, and we wish him well in his professional endeavors.

We Catalyze Great Research

As conveners, networkers, matchmakers, intermediaries, and go-betweens, we provide events and programs that unite people and drive research around digital agriculture. To date, CIDA's support has aided over \$100 million in funded grants. In 2022, these grants included the USDA Farm of the Future, NASA ACRES, USDA VitisGen2, and USDA CEA, with several proposals (including large center proposals) still outstanding. Our seed grants, letters of support, and community networking events have launched research programs, forging long-term research relationships across the university. We connect the dots to foster innovative research that benefits the field and farmers in NY State, across the country, and around the world.

Research Innovation Funding

Research Innovation Funding (RIF) funding provides faculty with two-year grants, with a maximum funding level of \$150,000 per grant. To qualify, each team must include co-faculty from at least two of the four colleges. This requirement helps to ensure projects are multidisciplinary in nature.

FACULTY FUNDING

6

seed grants

in 2022, totaling \$671,250

23

since inception

in 2019, totaling \$3,082,244



(Left to right) Martin Perez, Ph.D student; Ana Laplacette, M.S. student; Julio Giordano, Assoc. Professor, Animal Science; Clara Rial, Ph.D student

“

CIDA's funding was critical to our ability to secure USDA funding. CIDA funding allowed us to generate sufficient preliminary data, support a team of student researchers, and conduct critical research and work that was included in our proposal.”

Julio Giordano

Spotlight: Farm of the Future

The **Cornell Agricultural Systems Testbed (CAST)** for the Farm of the Future (FotF) is a \$4.4M competitive USDA National Institute of Food and Agriculture grant to host data-driven research, education, and extension across three New York farms—Cornell University Ruminant Center, Cornell Teaching Dairy Barn, and Musgrave Research Farm—under the aegis of CIDA. It is an exciting and far-reaching, cross-college collaboration that includes an interdisciplinary group of researchers, extension faculty (farmers, manufacturers, consultants, academic experts, and others), and teaching faculty from the College of Agriculture and Life Sciences, College of Engineering, Bowers College of Computing and Information Science, College of Veterinary Medicine, Charles H. Dyson School of Applied Economics and Management, and College of Arts & Sciences as well as a partnership with University of Arkansas at Pine Bluff.

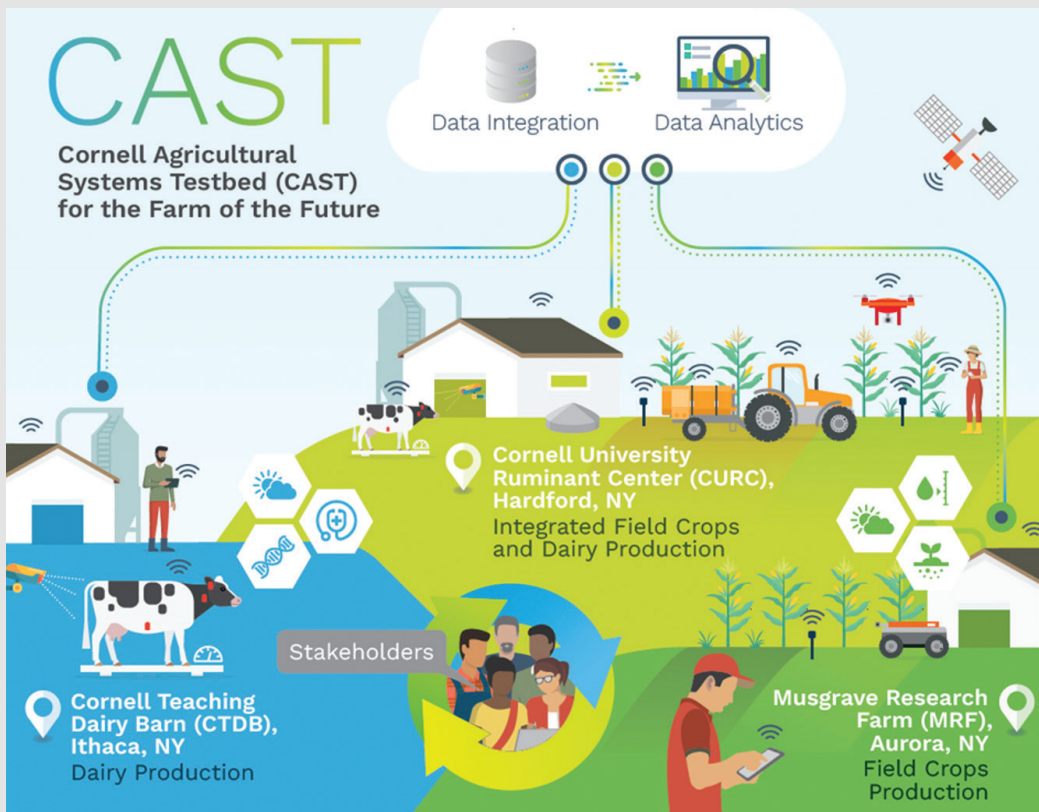
With a focus on field crops and dairy production as models of the US agriculture economy, CAST’s primary research goals are to:

1. Support the development, deployment, and evaluation of technological and data-driven breakthroughs.
2. Test and demonstrate existing and emerging technologies and practices under commercial-farm-like conditions.

Research at the CAST for the FotF will be divided into four thrusts:

1. Innovation in technology and farm practices
2. Data integration
3. Data analytics and decision support
4. Farm, food, and social systems impact assessment

Stakeholders will participate in every stage of problem identification, planning, implementation, evaluation, and feedback. CAST members will promote adoption of innovations developed and demonstrated during this grant through in-person and virtual demonstrations, testing, and evaluations. Education initiatives at the CAST include an exciting new minor in digital agriculture, in-person and virtual courses in DA for underrepresented students, and DA internships at the CAST for underrepresented students.



Events

In 2022 we hosted a monthly seminar series themed One Health, drawing speakers from across the country and around the world who presented their cutting-edge research. We also held three events aimed at promoting research. The first was a faculty retreat in the spring to help Cornell researchers meet and form teams for writing RIF proposals. In the fall, we held our second virtual symposium on October 31st and our sixth annual Workshop in person on November 1st at the Statler Hotel.



Global Development Professor Ed Mabaya provides opening remarks at the Africa Green Revolution Forum (AGRF), a cross-continent and global summit.



David Lobell

Digital Agriculture Symposium

Our online event, “Climate Change and Readiness for Agriculture: What’s the Role for Digital Agriculture?”, included a keynote from David Lobell, Stanford earth system science professor and Director of the Center on Food Security and the Environment, on the use of satellites to advance climate-smart agriculture. Moderated by Cornell faculty, the symposium sessions covered a wide range of digital agriculture topics: AgTech innovation ecosystems for social impact; controlled environment agriculture (CEA) approaches toward a more resilient food system; agriculture climate solutions; and the development, translation, and adoption of digital agriculture in New York state and beyond.



Allison Thomson

6th Annual Workshop

The Cornell community and invitation-only Workshop included updates from our directors, research innovation fund awardees and summer stipend recipients, as well as keynotes from Allison Thomson, AgMission Program Director of the Foundation for Food & Agriculture Research, and Samuel Alcaine, Cornell food science professor and co-Founder of Norwhey. Allison’s talk explored the potential role for digital agricultural solutions and data science to unlock agricultural climate solutions, and Sam spoke on the promise of fermentation research to not only change the types of foods we eat but also improve the sustainability our food systems.

Strategic Plan

In 2022, CIDA embarked on a strategic plan centered on three initiatives:

01

Launch New Research Frontiers

Launch new research frontiers.

This coming year, Julio Giordano will be leading this charge, aimed at broadening the scope of CIDA research by bringing in new research partners and exploring topics that are highly exploratory.

02

Foster Innovation

Foster innovation by recognizing and nurturing great new ideas.

Jenn Smith and the leaders at the Center for Regional Economic Advancement and Rev Ithaca developed a workshop series for CIDA faculty who may be interested in commercializing, licensing, or otherwise disseminating—perhaps through a start-up company—the results of their research.

03

Broaden Participation

Broaden participation in all our activities.

We are beginning with a three-pronged approach: Ed Mabaya and Gabriela Cestero are working to help us build partnerships in the Global South; Gabriela and Hakim Weatherspoon are establishing a minority serving institutions outreach plan; and we are working in collaboration with the Center for Research on Programmable Plant Systems (CROPPS) and with the Innovation Lab for Crop Improvement to reach out to historically black colleges and universities.

Looking Ahead

CIDA endeavors to increase the breadth and depth of our involvement with constituents around the globe and to continue our groundbreaking research at the forefront of digital agriculture. Our leadership team is excited about the efforts underway in 2023 and beyond. We thank you for your support of this important work.

[DIGITALAGRICULTURE.CORNELL.EDU](https://digitalagriculture.cornell.edu)

Our Mission

To create a dynamic community of researchers, farmers, industry partners, and other stakeholders that inspires learning, catalyzes innovation, and integrates fundamental discoveries across the agricultural and life sciences, engineering, computing and information sciences, and social sciences to advance equitable, sustainable, and efficient agriculture and food systems.

Our Vision

To foster continuous discovery, innovation, and dialogue to create equitable, sustainable, and efficient agriculture and food systems while inspiring new frontiers in science, policy, and practice.