PURDUE UNIVERSITY | Institute for Digital and Advanced Agricultural Systems


Image: view from the live camera feed at the Purdue Agronomy Center for Research and Education

Directors' Opening

Ignacio Ciampitti, IDAAS Co-Director

As we move closer to harvesting our major field crops, corn and soybeans across the U.S. Midwest, it's worth reflecting on the role of farmers' trusted advisors in this AI moment. The narrative that farmers are "rejecting" the AI revolution misses an important piece of the picture: many growers are already benefiting from data-driven solutions indirectly, through the advisors and retailers who help shape their agronomic decisions. Farmers can't reject a technology they may not even realize is already influencing the recommendations they receive. The CropLife Precision Ag survey supports this shift: more than 40% of retailers now see AI as a potential tool for improving agronomic practices. That's a meaningful signal, but it also suggests we're still early in this transition. The pieces of the puzzle needed to fully measure AI's impact on productivity and profitability across the industry aren't all in place yet. What's clear is that the AI revolution in agriculture isn't stalled; it's just taking a different, more indirect path into the field than many expected.

Dennis Buckmaster, IDAAS Director

Data is the new oil, they say. Deming wrote "In God we trust, all others must bring data." Reagan said "Trust, but verify". All things considered, and there surely is a lot to consider, my advice is to use AI as a tutor to help you understand something. Use it to see if there are gaps in your logic or confirm what you and those who advise you think you know. But keep yourself and trusted advisors as the critical humans in the loop. So for your edutainment, an other limerick. It is farmer centric but it is just as valid for we academics, policy makers, and business folks of all kinds.

A grower gave AI a try,
Hoping profits and yields would climb high;
It was quick with advice,
But not always precise—
So he still gave each answer the eye.

It can tutor and help me prepare,
Find a bug in a spreadsheet somewhere;
Yet when stakes are the crop,
I'll still pause to "Stop"—
The final check's still mine to bear.

Wishing you the best,

Dennis R. Buckmaster   Ignacio Ciampitti

Explore the latest from IDAAS—click here to stay connected!

Highlights

Maria Souza: Data-Driven Spray Drone Applications for Row Crops



Maria Carolina Souza is a second-year Ph.D. student under Dr. Tommy Butts, IDAAS Affiliate and in the Botany and Plant Pathology Department. Maria is from Minas Gerais, Brazil and earned her B.S. in Agronomy from the Federal University of Lavras. Maria also pursued a M.S. degree from the University of Arkansas. Maria's PhD research focuses on evaluating spray drone herbicide applications by assessing how application parameters, including swath width, nozzle type, and spray solution concentration, influence spray deposition and herbicide efficacy in corn and soybean production systems across spray drone platforms.

Her work evaluates the effectiveness of spray drones for herbicide applications throughout the growing season, from preemergence through preharvest applications, and compares their performance with conventional ground sprayers. In addition, she integrates imaging drones with spray drones to develop prescription maps for targeted herbicide applications.

Her research provides a comprehensive evaluation of spray drone applications in row-crop production systems and addresses key barriers limiting their adoption. By generating data-driven recommendations for spray drone applications, her work supports digital agriculture by helping growers and applicators make informed management decisions and optimize herbicide applications in row-crop production.

Talking to Data: How VR BioTalk is Transforming Plant Science

What if scientists could simply talk to their data, and instantly see answers come alive around them? That's the vision behind VR BioTalk, an innovative system led by Bedrich Benes ,an IDAAS Affiliate, and developed by Jorge Vazquez, Shuwen Yang, Yiqun Zhang, Jeffrey Demieville, Brennan Huppenthal, Nirav Merchant, Voicu Popescu, Alejandra Magana, and Duke Pauli at Purdue University and the University of Arizona.

The project combines virtual reality (VR), voice interaction, and advanced analytics into one seamless experience. Instead of writing code, researchers can ask questions out loud and watch results appear instantly in an immersive 3D environment. Built to tackle the growing challenge of massive plant datasets, VR BioTalk transforms complex 3D scans into meaningful traits like height, leaf area, and stem diameter, allowing users to explore and analyze thousands of plants intuitively and without writing a single line of code.

The system translates natural language into analytical commands with high accuracy and delivers results in just over a second, making it both powerful and easy to use, even for those without programming skills. By turning data analysis into a conversation, VR BioTalk opens the door to faster discoveries, deeper insights, and a more accessible future for scientific research across fields that rely on large, complex datasets.

Read the full paper here.

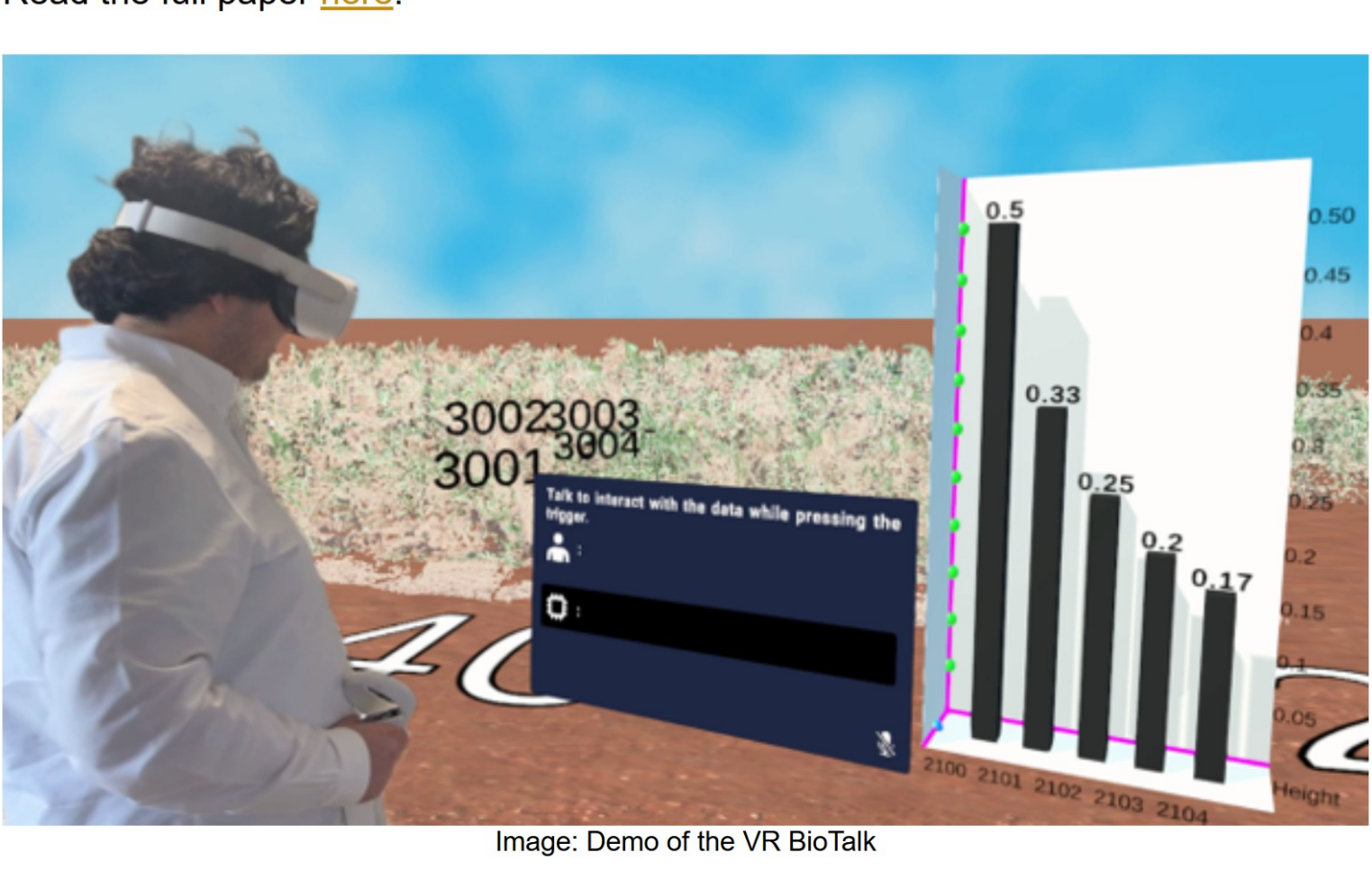


Image: Demo of the VR BioTalk

Purdue Students Advance Plant Imaging Innovation with LeafSpec Technology

Purdue University students Tianzhang Zhao and Zexian He, working under PI Dr. Jian Jin, an IDAAS Affiliate, are contributing to the continued development of LeafSpec, a portable hyperspectral leaf imaging system developed in the ABE Plant Sensor Lab in the Department of Agricultural and Biological Engineering.

LeafSpec is an accurate, affordable, and portable imaging tool that enables high-resolution hyperspectral imaging of plant leaves at 0.5 mm resolution bringing advanced plant sensing capabilities directly into field and greenhouse environments. Unlike traditional hyperspectral systems that are large and expensive, LeafSpec is designed for accessibility, mobility, and practical use in real-world agricultural settings.

Recent system upgrades represent a major improvement in performance, including approximately: i) 10× higher spatial resolution, ii) 10× higher spectral resolution, and iii) 30× greater illumination intensity.

These enhancements significantly improve image quality while also simplifying manufacturing and reducing device-to-device variability, supporting future scalability and deployment.

LeafSpec LLC is the only company working with Dr. Jin on the commercialization of Purdue's handheld leaf imaging technologies, helping bridge research innovation with practical applications.

Beyond hardware development, the student team is also advancing on-device plant feature prediction models and exploring automated robotic leaf scanning systems to increase data collection efficiency in both greenhouse and field environments.

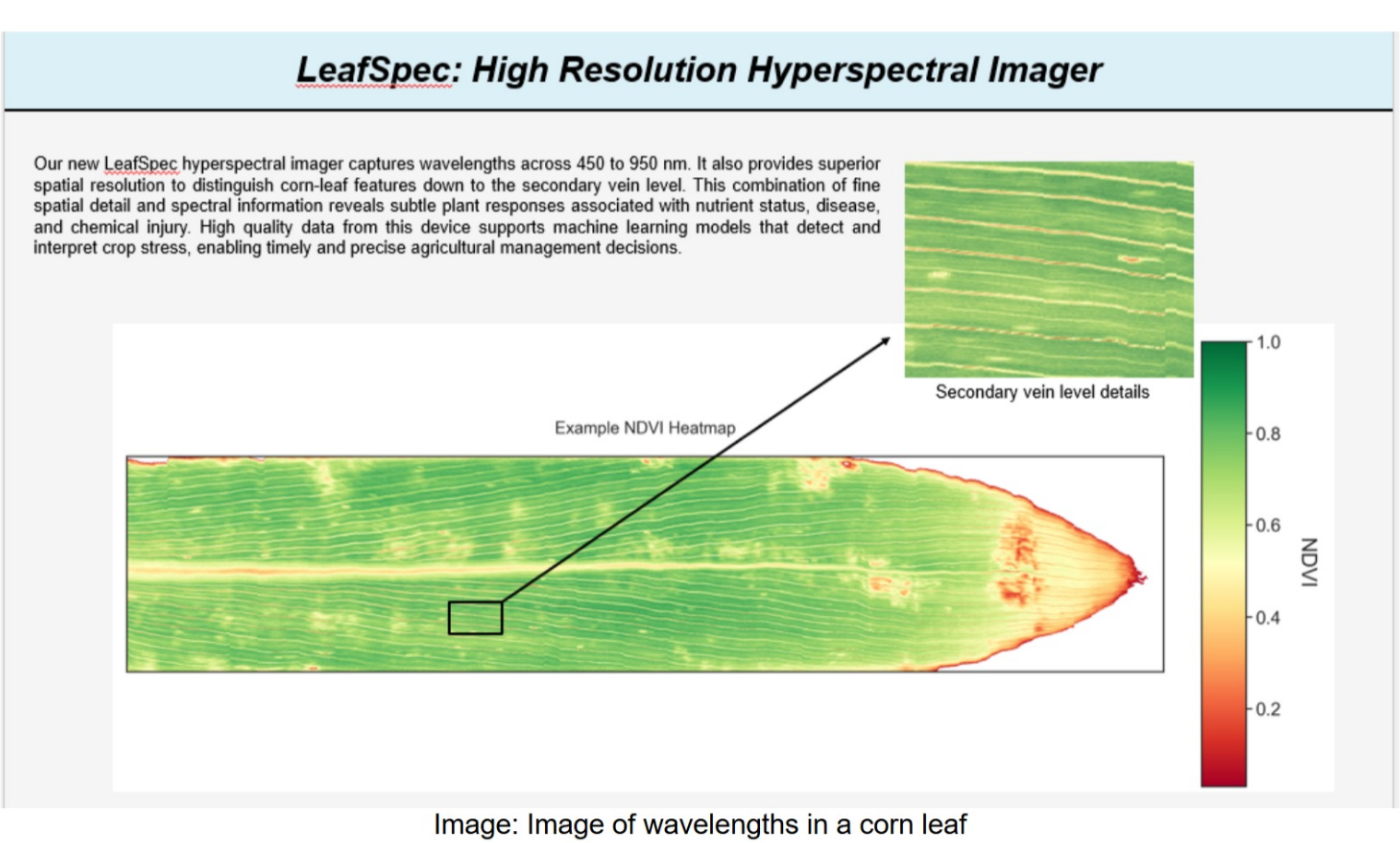


Image: Image of wavelengths in a corn leaf

Emmanuel Cooper: Integrating Remote Sensing and AI for Precision Weed Management in Corn and Soybean Systems



Emmanuel Cooper's research focuses on integrating remote and proximal sensing technologies with machine learning to improve weed management in corn and soybean production systems. He uses UAV and satellite-based sensing platforms with RGB, multispectral, thermal, hyperspectral, and other imaging technologies to detect herbicide injury, quantify early weed responses to herbicide applications, and identify indicators of weed mortality before symptoms become visually apparent.

This work directly supports digital agriculture by leveraging sensing technologies, artificial intelligence, and data-driven analytics to enable more timely, objective, and site-specific management decisions. In addition to monitoring crop and weed responses during the growing season, the research applies machine learning for weed seed detection and identification and explores how UAV and satellite data can be integrated to track weed emergence patterns, spatial distribution, and late-season escapes at larger scales. Ultimately, the goal is to develop scalable digital tools that help growers improve weed control, optimize herbicide use, and enhance the sustainability and profitability of crop production systems.

This research is conducted under the guidance of Dr. Tommy Butts, Clinical Assistant Professor of Site-Specific Weed Management in the Department of Botany and Plant Pathology and an IDAAS Affiliate. His program focuses on advancing precision weed management through the integration of remote sensing, artificial intelligence, and data-driven technologies. As part of Dr. Butts' research program, this work contributes to developing scalable digital agriculture solutions that improve weed control, optimize herbicide applications, and enhance the sustainability and profitability of crop production systems.

SyDAg 2026 Registration is Now Open

Growing With AI - 2nd SyDAg Symposium of Digital Agriculture

Mark your calendars and join us September 28 at the Beck Agricultural Center in West Lafayette, Indiana, for a student-led symposium exploring the latest innovations in digital and AI-driven agriculture.

The 2nd SyDAg Symposium of Digital Agriculture brings together students, researchers, educators, industry leaders, startups, extension specialists, agronomists, and growers to discover how emerging technologies are transforming agriculture. Through engaging presentations, networking, and real-world demonstrations, SyDAg creates opportunities to learn, collaborate, and shape the future of food and agriculture.

At SyDAg 2026, you'll:

Explore technologies that improve real-world agricultural decision-making. Connect with leaders from academia, industry, and the farming community. Learn about cutting-edge research and AI applications in agriculture. Build interdisciplinary collaborations and professional networks. Discover practical digital tools that are accessible and impactful.

Whether you're just beginning your digital agriculture journey or already working in the field, SyDAg offers valuable insights and connections for everyone.

Registration is now open. We look forward to seeing you this fall!



Image: SyDAg registration information

Digital Agriculture in the News

Too Much Nitrogen? Purdue Study Says Corn Growers Can Use Less Without Sacrificing Yields

New research from Purdue University is providing fresh insights into nitrogen management strategies for corn production across the Midwest.

A recent study led by Purdue researchers found that many Corn Belt farmers may be able to reduce nitrogen applications by 12–16% without significantly affecting yields. Researchers describe this as a potential "triple win" for producers improving profitability, supporting environmental stewardship, and maintaining strong agronomic performance.

With rising fertilizer costs and increasing interest in sustainable production practices, data-driven decision-making is becoming an essential tool for modern agriculture. This research demonstrates how combining agronomic expertise, advanced analytics, and digital agriculture approaches can help producers make more informed decisions about nutrient management while optimizing input use.

Congratulations to Ignacio Ciampitti and the research team for advancing knowledge that can help farmers, communities, and natural resources throughout the Midwest.

Read the full article here.


Image: Ignacio Ciampitti in the field with a tractor

Purdue Hosts National IoT4Ag Retreat Focused on the Future of Precision Agriculture

Purdue University recently hosted the 2026 Annual Retreat of the Internet of Things for Precision Agriculture (IoT4Ag), bringing together researchers, students, industry leaders, and growers to explore the future of data-driven agriculture.

Held May 19–21 at the Beck Agricultural Center and regional Indiana farms, the retreat highlighted innovative research, technology deployment, and collaboration across disciplines to advance precision agriculture. Participants from Purdue and partner institutions shared research updates, discussed emerging technologies, and explored solutions focused on improving agricultural efficiency, sustainability, and adoption.

The event featured student and postdoctoral research presentations, industry engagement opportunities, and discussions on technologies including sensors, robotics, wireless communication systems, artificial intelligence, and machine learning. These innovations are helping transform how agricultural decisions are made by integrating real-time data and advanced tools into farming systems.

IoT4Ag is a National Science Foundation-funded Engineering Research Center that brings together expertise across agriculture, engineering, environmental science, economics, and technology to develop solutions addressing future food, energy, and water challenges.

IDAAS Affiliates David Cappelleri, Melba Crawford, Dan Quinn, James Krogmeier, David Love, Yaguang Zhang, and Dennis Buckmaster are on the IoT4Ag team.

Read the full story here.


Image: Group photo of IoT4Ag 2026 Retreat

IDAAS Graduate Student Association Officially Recognized at Purdue

The Institute for Digital and Advanced Agricultural Systems (IDAAS) is pleased to announce the official recognition of the IDAAS Graduate Student Association (IDAAS GSA), a new student organization focused on advancing learning, collaboration, and professional development in digital agriculture.

Open to graduate students from all academic disciplines, the organization will bring together students interested in the future of agriculture and emerging technologies. Through networking events, professional development opportunities, industry engagement, educational programs, and community-building activities, members will gain valuable experience while expanding their knowledge and professional connections.

The IDAAS GSA will also work closely with IDAAS to support institute initiatives, events, and outreach efforts, helping strengthen Purdue's digital agriculture community while preparing students for careers in a rapidly evolving agricultural workforce.

How to Join

IDAAS GSA is open to all graduate students at Purdue University - West Lafayette who are interested in digital agriculture. There is no formal application process. To become a member, simply attend one of our meetings or events, introduce yourself, and get involved.

Members who are interested in a leadership role may run for an officer position. Officer elections are held annually, and any active member who meets the requirements for a specific position may run or be nominated.

To learn more about the association, upcoming events, and opportunities to get involved, visit our official Purdue BoilerLink page

For questions, contact volpato@purdue.edu or digitalag@purdue.edu.

IDAAS GRADUATE STUDENT ASSOCIATION

Extension

June Highlights: Advancing Digital Agriculture Through Education, Outreach, and Innovation

June was a busy and productive month. Throughout June, Adam Shanks, an IDAAS Executive Committee member, and other Purdue Extension leaders engaged with farmers, educators, students, and industry partners across Indiana. Their efforts included UAV education, digital agriculture training, consultations, and professional development activities that advanced awareness and adoption of emerging agricultural technologies while supporting Purdue Extension's mission of innovation and outreach. UAV education and demonstrations remained a major focus during the month.

Activities included:

- Spray Drone Education Day at the Southeast Purdue Agricultural Center (SEPAC) in partnership with the Indiana Spray Drone Association.
- UAV Education and Demonstrations for Indiana 4-H Academy participants, introducing students to careers and technologies in digital agriculture.
- DroneDeploy Training at the Northeast Purdue Agricultural Center (NEPAC) to help educators and professionals strengthen their drone mapping and data collection skills.
- UAV Demonstrations at the Hancock County Fair, providing attendees with hands-on exposure to drone technology and its applications in agriculture.

These events helped showcase how UAVs are transforming agricultural operations through improved scouting, data collection, and decision-making.

Consultation and Technical Assistance: Throughout the month, personalized consultations provided support to a variety of stakeholders interested in digital agriculture technologies:

- 3 Teacher Consultations
- 6 Farmer Consultations
- 7 Educator Consultations

Consultation topics ranged from UAV implementation and digital agriculture curriculum adoption to technology integration and precision agriculture applications.

Presentations, Demonstrations, and Outreach
June outreach efforts reached more than 250 farmers, educators, students, and agricultural professionals through presentations, workshops, demonstrations, and webinars across Indiana. Highlights included supporting the Indiana Spray Drone Association Education Day at SEPAC (150 attendees), exhibiting at the Indiana Agriculture Educators Association Summer Workshop, providing UAV education and demonstrations for Indiana 4-H Academy students and Clinton County youth, delivering DroneDeploy training for educators, and hosting a UAV demonstration area at the Hancock County Fair. Collaborative efforts also included a Tri-State Digital Platform Training with Ohio State University and Michigan State University focused on Climate FieldView and John Deere Operations Center, as well as a webinar discussing the impacts of waterlogged soils on row crop production. The month concluded with support for the adoption of the Agricultural Technology Curriculum by a high school agriculture program for the 2026-27 academic year.

Professional Development and Collaboration
Professional development activities focused on strengthening expertise in digital agriculture, artificial intelligence, agronomy, conservation, and Extension programming. Participation included field crops meetings, ANR updates, Pathways to the Future operations meetings, Digital Agriculture and AI in Extension discussions, CCSI staff and training committee meetings, RCPP project meetings, Digital Transformation Team meetings, the State 4-H Advisory Committee, and the Agronomy Extension Quarterly Meeting. Additional accomplishments included completing the Wisconsin Extension Artificial Intelligence Training Module and contributing to crop disease monitoring efforts through spore collection for Dr. Darcy Telenko's, IDAAS Affiliate, research program.

Looking Ahead
The momentum from June demonstrates the growing interest in digital agriculture technologies across Indiana. Through drone education, precision agriculture training, youth engagement, educator support, and collaborative partnerships, Purdue Extension continues to help build a more connected, data-driven future for agriculture. We look forward to expanding these efforts throughout the summer and continuing to provide impactful educational opportunities for stakeholders across the state.


Image: Collage of pictures from June Extension Activities

Course Offering

AGR 59500: Research Fundamentals int the Era of AI

Registration is now open for Fall 2026!

AI is changing how research is conducted, and this course is designed to help you stay ahead.

Join AGR 59500: Research Fundamentals in the Era of AI (1 credit) and learn how to responsibly use agentic and generative AI to design, analyze, and communicate research while building a strong foundation in research and data management.

Tuesdays | October 21 – December 9, 2026
5:30–7:00 p.m.
PFEN 241
CRN: 32041

Students can register through MyPurdue using CRN 32041.

Topics include:
✔ Research planning and the scientific method
✔ Data acquisition, organization, and quality assurance
✔ Data management, security, and documentation
✔ Data visualization and analysis
✔ Technical writing and scientific communication
✔ Responsible use of agentic and generative AI

Whether you're conducting research in agriculture, engineering, computer science, or another discipline, this hands-on course will equip you with practical skills to enhance your research workflow.

Questions? Contact digitalag@purdue.edu.


Image: Collage of student participation from Spring AGR 595 course

Interested in becoming an IDAAS Affiliate? Take a few minutes to complete the affiliate form and join our growing network of digital agriculture collaborators.

Become an IDAAS Affiliate!

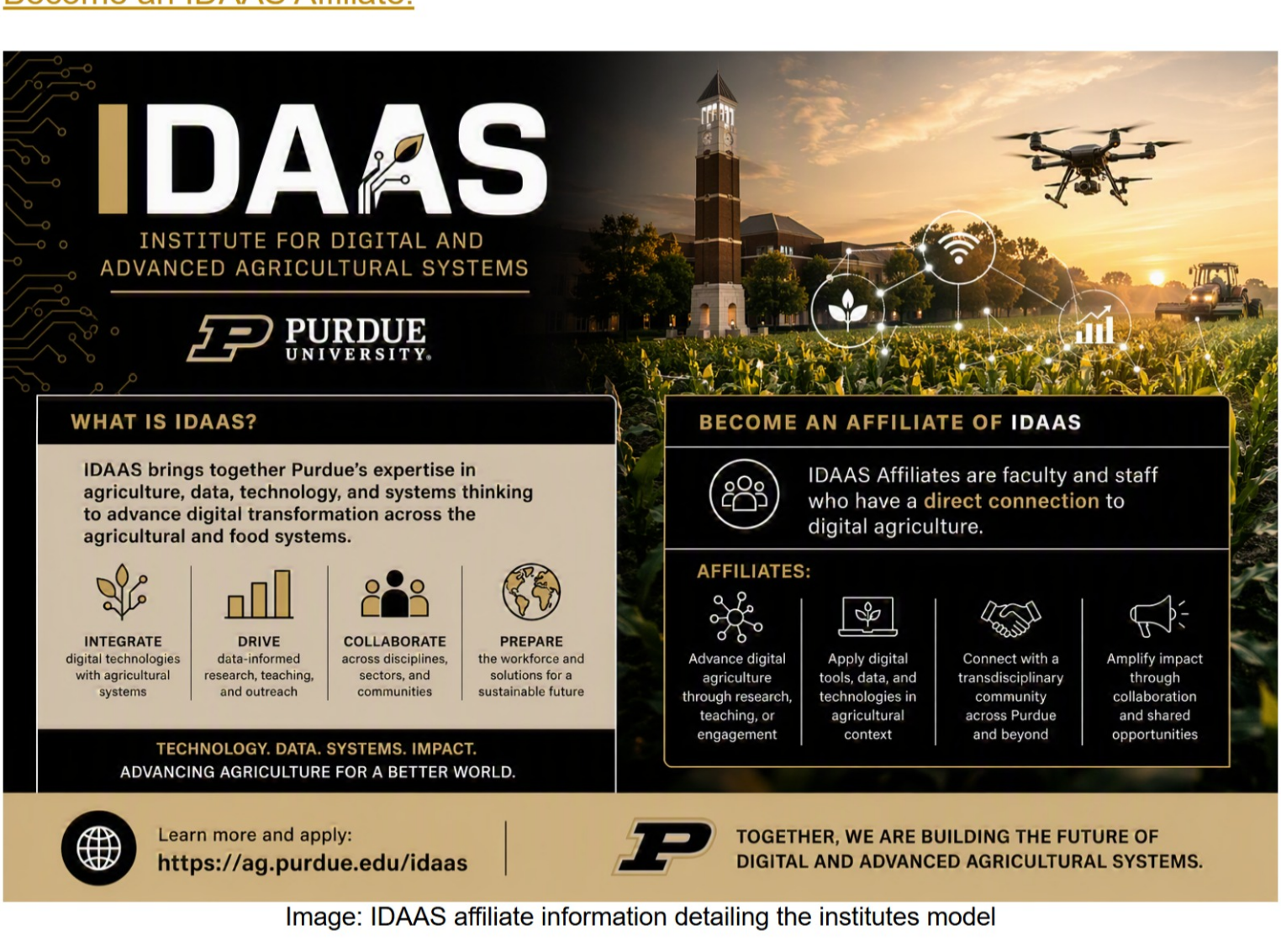


Image: IDAAS affiliate information detailing the institutes model

Explore the latest from IDAAS—click here to stay connected!

Digital Identity

What is Digital Agriculture? It's the use of digital devices to gather, process and analyze spatial and/or temporal data. This data can then guide targeted actions to improve agricultural efficiency, productivity and sustainability.

Contributions to this newsletter are welcomed. Please send your ideas, ideally about one paragraph with links and a photo, to digitalag@purdue.edu.

IDAAS newsletters are compiled and edited by Melinda Smith.