CAIA Big Event

March 28 and 29, 2024

CAIA Big Event – Agenda

<u>March 28, 2024</u>

Graduate student professional development (Room C Graduate Life Center)

5:00 – 6:00 pm   Dinner & networking

6:00 - 7:30 pm   Professional development activities:

- "You have you PhD, now what?" (Panel discussion)
- "Science communication" (seminar)

<u>March 29, 2024</u>

8:30 - 9:00 am   ***Affiliate Member Breakfast and networking*** (Wallace Hall Atrium)

8:30 am -12:00 pm: ***Graduate Student Presentations***

9:00 - 9:30 am   Morning Graduate Student Mixer
9:30 - 10:15 am   Poster Session I
10:25 - 11:10 am   Poster Session II
11:10 am - 12:00 pm   Lunch, Trivia, and poster award announcement

Afternoon session: for faculty affiliates (Lury and Barbara Goodall Room, Newman Library)

1:00 - 1:05 pm   ***Welcome*** (Dr. Kang Xia, Director for CAIA)

1:05 - 1:15 pm   ***VAES update and vision*** (Dr. Mary Burrows, Associate Dean for Research
          and Director for VAES, CALS)

1:15 – 1:25 pm   ***VCE update and vision*** (Dr. Mike Gutter, Director of VCE, Associate Dean
          for Extension, CALS)

1:25 – 2:00 pm   ***CAIA update*** (CAIA Leadership Team)

2:00 – 2:10 pm   **Break**

2:10 – 3:10 pm   **Fellowship of VT Centers**

2:10 – 2:20 pm   Sanghani Center for Artificial Intelligence and Data Analytics
          (Brian Mayer, Program Manager)

2:20 – 2:30 pm Center for Food Systems and Community Transformation
          (Kim Niewolny, Director)

2:30 – 2:40 pm Center for Educational Networks and Impacts (Lisa McNair, Director)

2:40 – 2:50 pm Center for Future Work Places and Practices
          (Ralph Hall, Associate Director)

2:50 – 3:00 pm Macromolecules Innovation Institute (Bob Moore, Director)

3:00 - 3:10 pm Institute for Advanced Learning and Research
          (Scott Lowman, Vice President of Applied Research)

3:10 – 4:00 pm   **Targeted breakout discussion topics:**
          - Opportunities for cross-center collaborations?
          - Path forward for CAIA?

4:00 – 4:20 pm   **Breakout session reports**

4:20 – 4:30 pm   **Conversation**

4:30 pm   **Adjourn**

Virginia Cooperative Extension Programs
A Collaborative Opportunity for CAIA Affiliated Faculty to Address Community Needs

Dr. Dan Goerlich, Associate Director, Economy, Community, and Food, Virginia Cooperative Extension - dalego@vt.edu
Dr. Cathy Sutphin, Associate Director, Youth, Families, and Health, Virginia Cooperative Extension - cmsutph@vt.edu
Jeremy Johnson, Associate Director and State 4-H Leader, Virginia Cooperative Extension - jejohns1@vt.edu

Virginia Cooperative Extension
Virginia Tech • Virginia State University

VT College of Agriculture and Life Sciences — Center for Advanced Innovation in Agriculture, Virginia Tech

Abstract

Building local relationships and collaborative partnerships since 1914, Virginia Cooperative Extension helps people put scientific knowledge to work through learning experiences that improve economic, environmental, and social well-being. We take concrete action that advances the well-being of all Virginians. Whether we're building a more resilient food system, supporting local economies, or mentoring youth, we bridge access to knowledge, and shape a brighter future for our communities. Extension faculty and staff come from a variety of backgrounds. This helps us better understand the distinct needs of all Virginians. It is through this lens that we can accurately and effectively assess, prioritize, and respond to local and state needs. Virginia Cooperative Extension has professional faculty and staff located in 107 city and county unit offices, 11 Agricultural Research and Extension Centers, six 4-H educational centers, and two university campuses. This network is enhanced by a connection to the resources of the land-grant universities across the nation, a large and dedicated volunteer base, and is located in every county and major city in the state where we deliver programming that helps citizens make positive life change. VCE educational programs are delivered in-person and virtually through field days, workshops, seminars, newsletters, videos, demonstration areas, and other methods in schools, in homes, and in the field every day.

Sample Programs

Health
Balanced Living with Diabetes • Diabetes Prevention Program • EXCITE Vaccination Education Program • Family Nutrition Program • Food Safety Programming for Businesses • Home Food Preservation • Master Food Volunteer Program • Physical Activity Programming (FitEX and LIFT) • Prevention and Control of Cancer through Community Education • Serv-Safe

Food
Beginning Farmer and Rancher Coalition • Family Nutrition Program • Food Innovations Program • Good Agricultural Practices (GAP) Certification • Home Food Preservation • Master Food Volunteers • Mobile Meat Processing • Pesticide Safety Education • Retail and Consumer Food Safety • Seafood Processing • Serv-Safe • Small Farm Outreach Program • Urban Agriculture Certificate Program

VCE Program Teams
4-H Positive Youth Development
Agribusiness Management and Economics
Agronomy and Horticulture
Animal Production
Community, Leadership, and Civic Engagement
Community, Local, and Regional Food Systems
Emerging Pests and Pest Management
Ensuring Safe High Quality Food from Field to Table
Family and Community Economics
Farm to School
Healthy People, Healthy Communities
Human Development
Natural Resources, Environmental, and Agricultural Literacy Education
Natural Resources Management

Family
Balancing Life: Supporting Families • Behavioral Health/Substance Abuse Prevention • Caregiving over the Lifespan • Kid's Market Place • Master Financial Education Volunteers • Mental Well-Being • Personal Finance and Money Management • Reality Store • Small Business Support • Tax Schools

Community
Certified County Supervisor Program • Coming Together for Racial Understanding • Community Planning • Emergency Preparedness • Energy Masters • Facilitation • Innovative Leadership • Master Gardeners • Master Naturalists • Recidivism • Strategic and Project Planning • Strengthening Your Facilitation Skills • VALOR • Virginia Geospatial Extension Program • Volunteer Development

Youth
4-H Healthy Habits • 4-H Healthy Living Summit • 4-H Intermediate Congress • 4-H STEM Challenge • 4-H Teen Summit • Ambassador Programs • Health Rocks! • National 4-H Congress • College Access Collaborative • Reality Store • State 4-H Congress • State 4-H Day at the Capitol • Tech Change Makers • Teen Diversity Task Force • Youth For the Quality Care of Animals 4-H Camping • DECA • HOSA • FFA

Economy
Consumer and Commercial Horticulture • Farm and Forestland Legacy Planning • Insect Identification and Integrated Pest Management • Livestock Quality Assurance and Value-Added Marketing • Nematode, Plant Disease, and Soils Diagnostics and Testing • Traditional and Niche Cropping Systems • Virginia Agricultural Leaders Obtaining Results (VALOR) • Virginia Forest Landowner Education Program (VFLEP) • Virginia Sustainable Harvesting and Resource Professional (SHARP) Logger Program • Water Quality • Women in Agriculture

Poster Presentations: Session 1

9:30 – 10:15 a.m.

1. **Identifying Sensory Descriptors and Aroma-Active Compounds in Domestic Edamame**

[1]***Rebekah J. Miller,*** [1]*Susan E. Duncan,* [1]*Renee Boyer,* [1]*Jacob Lahne,* [1]*Yun Yin,* [2]*Thomas Kuhar,* [3]*Bo Zhang,* [4]*Leah Hamilton*
[1]Food Science and Technology, [2]Entomology, [3]School of Plant and Environmental Sciences, [4]Agricultural Research Station

A continued increase in US edamame consumption has created opportunities for domestic edamame development and production. Domestically bred and produced edamame are known to be more advantageous to the local growers and consumers. Research into the sensory attributes of domestic edamame is currently limited. This project worked to develop a list of sensory descriptors important to the domestic edamame market and identify aroma-active compounds contributing to these characteristics. Four edamame varieties were chosen based on commercial availability and grown at 3 locations providing replications. Two additional samples were purchased from a local grocery store. A general descriptive analysis (DA) sensory panel with 8 trained panelists developed a list of 27 edamame characteristics including taste, flavor, and texture attributes, and evaluated all edamame samples in triplicate based on the characteristics determined. Gas chromatography-olfactometry (GC-O) was completed by 7 additional panelists who were trained on 12 identified aroma-active compounds in edamame. Pseudomixed ANOVA showed 12 of the identified characteristics through DA to be significantly different ($p < 0.05$) between varieties including 3 taste attributes ("umami", "sweet", "bitter"), 6 aroma attributes ("fresh", "salad", "grassy", "vegetable oil", "alcohol", "burnt toast"), and 3 texture attributes ("hardness", "crunchy", "juicy"). GC-O results underwent Kruskal-Wallis test revealing oct-2-enal as the sole compound displaying significant variability ($p < 0.05$) across edamame varieties. Significant differences identified in taste, flavor, and texture suggest diverse sensory characteristics currently present in the domestic edamame market. The application of these sensory findings could help support further breeding and additional product development as domestic edamame production continues to flourish.

2. **Surrogate Modeling to Explore Associations Between Stocking Density and Environmental Footprints**

[1]***Naa Kotey,*** [1]*Robin White*
[1]School of Animal Sciences

As we explore strategies to incentivize adoption of climate-smart grazing systems, there is a need for producer-friendly guidance on how management choices influence the environmental impact of their operations. The objective of this study was to use Bayesian learning network analysis (BLN) as a tool for

surrogate modeling of associations between stocking density and predicted environmental footprints.The hypothesis was that the network could simplify identifying environmental footprint changes with different stocking densities, aiding on-farm decision making. The USDA Integrated Farm System Model (IFSM) was used to run 576 simulations varying in input stocking densities, grass types, soil types, topography and fertilizer applications. Using data from these simulations, BLN analysis was leveraged to identify the graphical structure and derive the network parameters. To assess the network's potential as a surrogate model for the complex IFSM, the root mean squared error (RMSE) was estimated for each environmental impact output (carbon, reactive nitrogen, blue water and green water footprints, carbon dioxide, manure, animal and land emissions). The BLN revealed the relationships between variables. The model's predictions, with RMSE ranging from 1.99% to 19.8%, reflected a high level of accuracy in serving as a surrogate for IFSM, while packed within a tool that is considerably simpler to use. This study demonstrated the opportunity to leverage BLN for surrogate modeling of environmental responses to management choices, particularly in extension and education contexts where accurate directionality of predictions is sufficient to support user understanding of the linkages between management and environmental outcomes.

3. Narrow-Wavelength Red LED Lighting on Quality and Aroma Expression of Hydroponic Fennel (Foeniculum Vulgare Mill)

[1]*Jingsi Liu*, [1]*Yun Yin*, [2]*Adam Sumner*, [2]*Alex Harris*, [2]*Song Li*, [2]*Bas Bargmann*, [2]*David Haak*
[1]Food Science and Technology, [2]School of Plant and Environmental Sciences

Fennel (Foeniculum vulgare Mill.) is an aromatic herb cultivated worldwide. Aroma is an important characteristic of fennel and can be affected by many environmental stimuli, but the effects of supplemental red light on fennel aroma remain unclear. The aim of this study was to investigate the effects of narrow-wavelength red LED light on fennel aroma, and to identify genes involved in aroma formation in response to supplemental red light. The results showed that supplemental red LED increased the total concentration of aroma-active compounds in fennel leaves, especially phenylpropanoids, such as trans-anethole (sweet, anise), estragole (anise, herbal), and p-anisaldehyde (floral, sweet). Transcriptome analysis revealed 2236 differentially expressed genes between fennel grown under control conditions and fennel grown with supplemental red light. Several genes involved in phenylpropanoid biosynthesis were up regulated by supplemental red light, such as eugenol synthase and isoeugenol synthase. Transcripts encoding transcription factors, mainly from the MYB, bHLH, MYC/bHLH, and ERF families, were also identified. Our results provide insights into the molecular mechanism of aroma biosynthesis in fennel and demonstrate the potential of controlled environment and LED to accelerate aroma improvement of culinary herbs.

4.   Precision Agriculture in Early Pest Detection

[1]*Atoosa Nikoukar*, [1]*H. Farrokhzadeh*, [2]*M. Vahidi*, [1]*S. Parizad*, [1]*U. Panta*, [2]*S. Shafian*, [1]*A. Rashed*
[1] Southern Piedmont Agricultural R & E Center, [2] School of Plant and Environmental Sciences

Managing insect pests is one of the challenges in tobacco production that continue to negatively impact tobacco yield and quality. Implementing effective, environmentally-friendly and cost-effective pest management rely on early detection and identification of the stress factors, as two of the most important components of integrated pest management (IPM). Technological advances in imaging can offer new tools for effective monitoring and timely implementation of pest management practices. This project was developed to determine whether spectral reflectance can be used to detect biotic stresses and if the identified spectral signatures are species-specific. In a series of greenhouse experiments, we

measured 15 vegetation indices of infested tobacco seedlings based on the recorded reflectance in one, two and three weeks after infestation, using ADS FieldSpec spectroradiometer. Three insect pests were used in these bioassays including green stinkbug, tobacco aphid, and tobacco budworm. Our greenhouse results indicated that spectral reflectance can be used to detect pest presence as early as one week after infestation, and the spectral signatures associated with the infestations were species-specific for tobacco budworm and stink bugs. In the field trial, we collected images from a drone equipped with a Pika L hyperspectral sensor of infested tobacco plants, a natural infestation with multiple pests with tobacco aphid being the primary. The control plots were treated with Admire Pro in transplant water. Our finding showed that the extracted bandwidths were sensitive enough to detect treated and untreated plots in the field and those representing 392-503 nm wavelengths were negatively correlated with aphid numbers.

5. Survival of Salmonella on Biodegradable Mulch, Landscape Fabric, and Plastic Mulch

[1]**Alyssa Rosenbaum**, [1]*Alexis M. Hamilton*, [2]*Steven L. Rideout*, [2]*Laura K. Strawn*
[1]Food Science and Technology, [2]School of Plant and Environmental Sciences

Ground covers are a horticultural practice implemented to improve plant growth and assist in pest management. Limited data exists on whether ground covers used in fresh produce production may pose a cross-contamination risk. This study evaluated the survival of Salmonella on three ground cover types: biodegradable mulch, landscape fabric, and plastic mulch. All ground covers were constructed to fit 100x15mm (15cm2) plates. Coupons were spot-inoculated with a seven-strain rifampicin-resistant Salmonella cocktail and stored in a growth chamber with conditions set to 23°C and 55% RH. Coupons were enumerated for Salmonella at 0, 0.06, 0.17, 1, 2, 3, 5, 7, 30, 60, 90, and 140 days (n = 30). If counts were below the limit of detection (< 0.12 log CFU/cm2), samples were enriched following modified FDA BAM methods. Summary statistics and significant differences in Salmonella by time and environment ($P \leq 0.05$) were determined by Tukey's HSD test in RStudio (V4.2.3). Through day 30, biodegradable mulch had the lowest reduction (2.47 ± 0.26 log CFU/cm2) of Salmonella followed by landscape fabric (3.07 ± 0.30 log CFU/cm2) and plastic mulch (3.86 ± 0.72 log CFU/cm2). Salmonella reduction leveled at day 60, and no significant differences were observed between reduction and all tested materials at day 90 ($P > 0.05$). Salmonella survived for more than 140 days on all ground cover materials. No significant differences were observed between biodegradable and plastic mulch reduction at day 140 ($P > 0.05$). Ground-cover material impacted Salmonella survival and should be considered in risk management.

6. Citizen Science, Leadership Identity, and Agricultural Innovation

[1]**Adebayo Bolanle**, [1]*Hannah Sunderman*
[1]Agricultural Leadership and Community Education

Over the years, research has revealed low adoption of various agricultural innovations among farmers, thus becoming a significant constraint in improving farming yields, productivity, and income (Curry et al., 2021). In recent years, scholars have begun to emphasize the exclusion of farmers from producing agricultural innovations as a significant contributing factor to the low adoption of agriculture (Baranski & Ollenburger, 2020). Such a passive top-down approach to agricultural innovation development has not only caused a low adoption of agricultural innovation but has also ignored the social benefits of agricultural innovation, such as farmers' role in the diffusion of innovation (Baranski & Ollenburger,

2020). Thus, it becomes imperative to involve grassroots community farmers in agricultural innovation and product development for increased innovation transition from labs and shelves to farms. Agricultural citizen science, which involves the participation of the nonscientist populace in scientific research (Rossiter et al., 2015), is one of the ways to increase grassroots farmers' involvement in adopting agricultural innovation. Drawing from social identity theory, participation in citizen science could ascribe to farmers an adequate knowledge of agricultural innovation and a status of responsibility to adopt and diffuse the innovation, thus a leader identity (Day & Harrison, 2007; Tajfel, 1972). Leader identity is how one perceives oneself as a leader, which precedes various leadership expressions (Day & Harrison, 2007). Invariably, leader identity developed by farmers could encourage the adoption and diffusion of innovation. The poster aims to show the interrelationship between agricultural citizen science, leadership identity development, and the adoption and diffusion of agricultural innovations.

7.   Field-scale Modeling of Irrigation and Nitrogen Management Strategies on Corn Yield, Nitrogen Uptake and Nitrate Leaching Using SWAP-WOFOST Model Under Changing Humid Climates

[1]*Suman Budhathoki*, [1]*Julie Elizabeth Shortridge*
[1]Biological Systems Engineering

Effective irrigation and nutrient management have become crucial to sustain agricultural productivity while mitigating environmental risks in the changing climate. Regional level studies suggest that climate change could lead to more variable and intense rainfall, particularly in the Eastern U.S. (Lall et al., 2018; Shortridge, 2019), leading to negative impacts on crop yields and environmental pollution if adaptive measures are not adopted. Precision irrigation and nutrient management could help reduce these impacts, but the benefits of precision management are not well-quantified under different climate scenarios. This study evaluates the impact of changing weather conditions on corn yield, nitrogen uptake, and nitrate leaching in humid climates under conventional and precision water and nutrient management strategies. Agronomic impacts are estimated using a SWAP-WOFOST model calibrated using 2020-2021 field data from experimental corn trials at the Tidewater AREC located in Suffolk, Virginia. We will investigate three management approaches: the basic rainfed system with a single nitrogen application and no irrigation, the conventional system with a single nitrogen drying scenario with higher temperature and reduced precipitation, warming-variable rainfall pattern scenario with higher temperature and greater GINI coefficient, and warming-wetting-variable rainfall pattern scenario with
higher temperature, greater precipitation and greater GINI coefficient. By quantifying the benefits of precision management as an adaptation measure to varying climate conditions, this work provides insights into both impacts of extreme weather events on agricultural productivity and the effectiveness of different management practices in mitigating these effects in humid regions.

8.   Analysis of different Spray Nozzles and Volumes for UAS-Based Herbicide Applications

[1]**Fatemeh Esmaeilbeiki,** [1]Dhiraj Srivastava, [2]Daniel Martin, [1]Vijay Singh
[1]Eastern Shore Agricultural Research and Extension Center, [2]Aerial Application Technology Research

Unmanned Aerial Systems (UAS) have shown the potential for effective herbicide applications. The studies were conducted with two main objectives to evaluate 1) three different volumes, and 2) two nozzle types (air-induction, and regular flat fan) for greater efficacy and coverage of preemergence herbicides. . For objective 1, experiments were conducted using 18.7 L ha-1 (UAS-2; 2 gallons/A), 37.4 L

ha-1 (UAS-4; 4 gallons/A), and 74.8 L ha-1 (UAS-8; 8 gallons/A) of spray volume with UAS, compared with a CO2 pressurized backpack sprayer at 140 L ha-1 (BP-15). Experiments were conducted in a completely randomized block design with four replications. A premix of atrazine, bicyclopyrone, mesotrione, and S-metolachlor was used as a preemergence herbicide. . Analysis of Variation (ANOVA) was performed, and means were separated using Tukey's HSD (α=0.05). Significant differences were observed among spray application treatments, where 18.7 L ha-1 (UAS-2) treatment did not provide effective weed control and was inferior to 37.4 L ha-1 (UAS-4 GPA) and 74.8 L ha-1 (UAS-8). In the second experiment, air-induction nozzles did not provide excellent control due to larger droplet size, whereas regular flat fan nozzle at 4 gallons/A provided 100% weed control. Air-induction nozzles are useful for drift reduction, however, these nozzles are not optimal for preemergence applications requiring finer droplet sizes. The regular flat fan nozzle exhibited a 30% increase in weed control compared to the air-induction nozzle when applied at the preemergence stage. Additional studies with several other nozzle types will be conducted in summer 2024.

9. Genetic Control of Residual Variance of Growth Traits in Angus Cattle

[1]*Sabrina Amorim*, [2]*Gota Morota*
[1]School of Animal Sciences, [2]Center for Advanced Innovation in Agriculture (CAIA)

The demand for more uniform animal production, stimulated mainly by economic incentives, has increased the interest in reducing the variability of traits through selection. Evidence for genetic control of the residual variance of some traits, or genetic heterogeneity of residual variance, has made uniformity a potential response variable in genetic studies. The objectives of our study were 1) to investigate the genetic heterogeneity of residual variance on growth traits in Angus cattle, 2) to compare the results of statistical approaches between homogeneous and heterogeneous residual variance models, and 3) to evaluate the effectiveness of the power transformation to account for scale differences (Box-Cox transformation). The comparison was based on the estimated genetic parameters and the accuracy of the estimated breeding values for the mean and residual variances. A total of 75,000 birth weight (BW) and 49,803 yearling weight (YW) records were used in the analysis. The results supported the hypothesis of genetic heterogeneity of residual variance on growth traits and the possibility of selection, measured by the genetic coefficient of variation of residual variance (0.80-0.83 for BW, 0.63-0.67 for YW using untransformed and transformed data, respectively). However, low heritability estimates for residual variance (0.008-0.1012 for BW and 0.092-0.093 for YW) combined with positive genetic correlations between mean and residual variance limit the genetic response to selection for production uniformity when increasing BW and YW. The Box-Cox transformation reduced the undesirable mean-variance relationship, but genetic heterogeneity of the residual variance remained beyond the scale effect.

10. Assessment of Thermal Imaging as a Tool to Objectively Body Condition Score Livestock

[1]*Alexandra P. Webster*, [1]*Ryan K. Wrigh*t, [1]*Claire B. Gleason*, [1]*Naa Adei Kotey*, [1]*Riley K. Thompson*, [2]*Giovanna M. Lungu*, [1]*Nikki B. Tabataba*i, [1]*Jillian B. Hammond*, [1]*Robin R. White*
[1]School of Animal Sciences, [2]Biochemistry

Body condition scoring (BCS) a method of qualitatively ranking body fat reserves on a scale of 0 to 9, serves as a vital tool in assessing animal health and management effectiveness. Contemporary strategies for evaluating body condition of livestock are subjective and there is a need to identify more objective tools. This study explored whether thermal imaging could provide an objective means of BCS. We hypothesized that thermal imagining would enable BCS because surface temperature will be affected by body fat reserves, which act as insulation and energy storage. A survey of 14 quarter horses and 14 thoroughbreds was conducted across four farms with BCS assigned to seven body areas by eight different individuals either in-person or via video. Thermal images were collected from both sides of the body and analyzed for surface temperature in each of the seven body areas. Covariates, including breed, ambient temperature, cloud coverage, housing conditions, blanketing status, and scorer's location, were collected. Data were analyzed using a linear mixed effect model with fixed effects for surface temperature, all covariates, and their two-way interactions. Scorer was used as a random effect. The two-way interactions between surface temperature and ambient temperature (P=0.011), cloud cover (P<0.001), blanketing status (P<0.001), breed (P<0.001), and scorer location (P=0.003) were all significant, and the interaction with housing type (inside/outside) tended toward significance (P=0.064). Thermal imaging shows promise as an objective means of BCS; however, robust methods will have to consider numerous conflating factors like environment, housing, and management.

11.   The Influence of Willingness to Pay (WTP) on the Adoption of Animal Waste Management (AWM) Practices Through Cost Share Programs

[1]*Jillian Hammond*, [1]*Robin White*
[1]School of Animal Sciences

There is a need to mitigate greenhouse gas emissions (GHGe) from AWM; however, mitigation practices are expensive and do not directly support farm profitability (USGAO, 2024). Cost share programs supporting AWM exist, however their efficacy and what they reveal producer and government actors' WTP is unknown. This study leverages historical cost share records (n=483) from the Virginia Department of Conservation and Recreation to determine the realized WTP of government agencies and livestock producers for high-cost capital improvements in AWM. Data were analyzed visually to explore distribution, and through linear mixed-effects models exploring how revealed WTP was influenced by relevant factors. The average AWM implementation cost was $100,556, with median allocation shares for producers and government agencies being 75% and 18% of total project costs respectively. Government funded cost share was significantly (P<0.01) related to animal type, practice, hydrologic unit priority, drainage, county, and amount of waste treated, further demonstrated in the prioritization of cost share funding directed toward facilities needing AWM amendments. Seasonal feeding and dairy loafing lot AWM received less government cost share (median 66% to 70%) where incineration facilities and non-dairy loafing lots received greater cost shares of (median 88% and 125%). Comparatively, producer costs paid were unrelated (P>0.05) to many factors significant to government agencies, with animal type (P=0.004), practice (P<0.001), and county (P<0.001) holding more influence. This illustrates that producer interaction with cost share programs is focused on improving operation returns. Limited producer WTP necessitates increased government investment shares for ongoing GHGe mitigation in animal agriculture.

12.   Weed Management with Machine Learning and User-Friendly Web Tool

[1]*Rutvij Wamanse*, [2]*Dhiraj Srivastava*, [1]*Vijay Singh*
[1]Eastern Shore AREC, [2]Donald Danforth Plant Science Center

Integrating Unmanned Aerial System (UAS) with advanced machine learning offers an effective approach for weed monitoring and control. This study seeks to develop a fast, lightweight model for detecting common ragweed (Ambrosia artemisiifolia) in soybean (Glycine max) fields, tailored for precision spray applications using UAS. The approach relies on strong machine learning models trained on high-quality weed image datasets, which are currently lacking in weed science. Data was gathered from 2021 to 2023 in Virginia, both from research sites and farmers' fields, using a DJI M-300 drone flying at 12 meters altitude to capture various growth stages of common ragweed and soybean. To train the model, 500*500 pixel samples were labeled using the VGG Image annotator (VIA). Different model architectures, including the latest YOLOv8 series, were tested for weed detection, with comparisons against YOLOv5 series. Precision and recall metrics evaluated the models, revealing that YOLOv8 nano (YOLOv8n) had the fastest prediction speed at 1.731 milliseconds, with a mean average precision of 81.6% at an intersection over union of 0.5. The research suggests that YOLOv8 holds potential for real-time, site-specific spot spraying operations. A user-friendly web portal allows easy image uploading and instant results, tailored for non-technical users. Machine learning accurately identified common ragweed spots, resulting in UAS-based spot spray applications achieving over 88% control. Future research targets lightweight machine learning models for swift, accurate detection of various weed types, deployable on edge devices. An intuitive interface will facilitate comprehensive weed detection without the knowledge of coding.

13. Volatile Fatty Acid Prediction from Ruminally Sensed Temperature, pH, Dissolved Oxygen, and Oxidation Reduction Potential

[1]**Ryan Wright**, [1]*Robin White*
[1]Animal Sciences

Existing methods for measuring ruminal volatile fatty acid (VFA) concentrations are expensive and sensitive. This study evaluated the viability of a sensor suite in predicting VFA concentrations in situ. A crossover experimental design using 4 ruminally cannulated cows and 2 diets was used to collect data over 2, 3-day periods. A DF Robot Bluno microcontroller, SD card reader, and battery in a waterproof junction box with wired, waterproof probes for monitoring aqueous temperature, oxidation reduction potential, dissolved oxygen, and pH extended into the rumen through the cannula plug for the duration of each period. Cows were fed at 0600 h and 1800 h daily. Diets were formulated to vary in forage percent. Hourly from 0600 h to 1800 h, rumen fluid samples were collected and stored at -20 C until VFA concentration analysis via gas chromatography. Sensor measurements outside the physiological range were omitted and remaining data were aligned with VFA concentrations via collection time. Features used in analysis included raw sensor data along with rolling averages, rolling standard deviations, and leading and lagging values. Data were split for hyperparameter tuning (15%), model training (55%), and independent evaluation (30%). Random forest regressions were fit using the measured and engineered features to predict each VFA concentration. Lin's concordance correlation coefficient (CCC) was calculated from model predictions and evaluation data. The CCC of all individual or of total VFA were greater than 0.99. Alternative derivation strategies yielded very poor CCC (<0.10), highlighting the importance of evaluation manner aligned with anticipated tool use.

14. Reduce Power Consumption of Wireless Sensor Node System through Edge Computing

[1]**Yuezhong Xu**, [1]*Dong S. Ha*
[1]Electrical and Computer Engineering

A wireless sensor node (WSN) system, capable of sensing animal motion and transmitting motion data wirelessly, is an effective and efficient way to monitor pigs' activity. However, the raw sensor data sampling and transmission consumes lots of power such that WSNs' battery have to be frequently charged or replaced. The proposed work solves this issue through WSN edge computing solution, in which a Random Forest Classifier (RFC) is trained and implemented into WSNs. The implementation of RFC on WSNs does not save power, but the RFC predicts animal behavior such that WSNs can adaptively adjust the data sampling frequency to reduce power consumption. In addition, WSNs can transmit less data by sending RFC predictions instead of raw sensor data to save power. The proposed RFC classifies common animal activities: eating, drinking, laying, standing, and walking with a F-1 score of 93%. The WSN power consumption is reduced by 25% with edge computing intelligence, compare to WSN power that samples and transmits raw sensor data periodically at 10 Hz.

15.   Improving Pig Weight Estimation: Innovative Transfer Learning in Video Image Analysis

[1]**Sanjana Bharadwaj**, [1]*Pranjal Ranjan*, [1]*Yingqi Pei*, [2]*Ye Bi*, [2]*Gota Morota*, [1]*Dong Ha*, [1]*Sook Ha*
[1]Electrical Computer Engineering, [2]Animal Sciences

Pig weight is pivotal in pork production, offering crucial insights into growth rates, disease prevalence, and overall health. Traditional manual methods of estimating pig weights are both time-consuming and labor-intensive. In recent years, there has been a shift towards image processing-based approaches and traditional statistical methods. However, these methods often lack efficiency and accuracy due to extensive preprocessing requirements and limited generalizability. In this study, we propose a novel approach employing deep learning (DL) techniques on depth images to estimate pig weights. Our focus is on assessing the effectiveness of advanced DL approaches compared to traditional methods. Through a custom image preprocessing pipeline, we train DL models to extract meaningful information from depth images for weight estimation. Our findings show that XceptionNet gives promising results, with a mean absolute error of 2.82 kgs and a mean absolute percentage error of 7.42%. In comparison, the best performing statistical model, support vector machine, achieved a mean absolute percentage error of 21.56%.

Poster Presentations: Session 2

10:25 – 11:10 a.m.

1. **Dietary Crude Protein is Independent of Rumen Microbial Community Ecology in Lactating Dairy Cows**

[2]*Alvaro Morales Ramirez*, [1]***Mingsi Liao***, [1]*Jane Duncan*, [1]*Kayla Alward*, [1]*Connor Owens*, [2]*Leticia Marra Campos*, [1]*Mark D. Hanigan*, [1]*Rebecca Cockrum*
[1]School of Animal Sciences, [2]Instituto de Ciencia Animal

High-energy diets are commonly recommended to meet protein requirements in dairy cows, aligning with National Research Council (NRC) guidelines. However, recent research suggests that diets containing decreased crude protein (CP) demonstrated increased nitrogen efficiency compared to traditional NRC recommendations. This study aimed to examine the impact of differing dietary CP concentrations on phenotypic performance and the rumen microbial ecology using shotgun metatranscriptome analysis. Four fistulated lactating Holstein cows (806 ± 38 kg of body weight, 260 ± 62 days in milk, and 26.5 ± 12.0 kg milk/d) were randomly allotted to one of two dietary treatments differing by CP concentrations: 16.6 % CP (NRC) versus 13.2 % (lowCP) in a crossover design (2 periods of 18 days each). A linear mixed model with repeated measurements over time was used to evaluate the effect of diet on dry matter intake (DMI), milk yield (MY), residual feed intake (RFI), and residual efficiency index (REI) in SAS and a PERMANOVA test was used to evaluate differences in the microbial community and function in RStudio. As expected, DMI ($P = 0.29$), MY ($P = 0.23$), RFI ($P = 0.38$) and REI ($P = 0.49$) did not differ between the two dietary treatments and showcased a similarity in the rumen microbial community ($P = 0.24$) and function ($P = 0.13$). This convergence in rumen microbiota, coupled with the absence of performance disparities, suggests that the lower CP diet could serve as a cost-effective alternative without compromising productivity or the delicate balance of rumen microorganisms.

2. **Use of Transcriptome-Based Identification and Molecular Cloning Approaches to Elucidate Biosynthetic Pathway of Pharmacologically Important Plant Bioactive Compound Present in Blueberry**

[1]***Ishveen Kaur,*** [1]*Courtney Leisner*
[1]School of Plant and Environmental Sciences

Blueberry is the second most important crop in the US, owing to increased awareness of its health benefits due to the presence of several bioactive compounds. One such plant bioactive compound is monotropein. It has been reported that monotropein is found in only three plant species, namely Monotropa Uniflora, Morinda officinalis (Vaccinium spp). Most work on monotropein has been done in Morinda officinalis where it has been shown to impart several human health benefits. Recent work has also identified monotropein in both wild and cultivated blueberries. However, how monotropein is produced and the type of candidate genes involved in the biosynthesis of monotropein in blueberries has yet to be elucidated. Our research group used bioinformatics, comparative genomics and protein engineering techniques to functionally characterize the ISY (Iridoid Synthase). Currently, we are focusing on functionally characterizing Geraniol Synthase (GES) gene, as recent work has found the expression of GES is significantly associated with the production of iridoids in other plant families. Our overarching goal is to elucidate the biosynthetic pathway of production of monotropein in blueberry to breed

blueberries with higher production of monotropein to promote healthier lifestyle, otherwise derived from expensive therapeutic drugs.

3. **Optimizing Soil Nutrient Management: Agricultural Policy/Environmental Extender (APEX) Model Simulation for Field Scale Phosphorous Loss Reduction in Virginia**

[1]***Sheetal Kumari***, [1]*Jitender Rathore*, [2]*Shreya Mitra*, [3]*Maaz Gardezi*, [4]*Jody Stryker*
[1]School of Plant and Environmental Sciences, [2]Agricultural, Leadership and Community Education, [3]Sociology, [4]Environmental Systems

Managing soil nutrients is crucial for enhancing crop productivity and meeting consumptions demands while minimizing environmental impacts. Phosphorous (P) stands out among the 16 essential soil nutrients, in Virginia, where natural P levels are typically low. Adequate amount of P is necessary for early root formation and plant growth while excess amount leads to increase eutrophication. While previous research has primarily focused on watershed level studies, current investigation aims to simulate the impacts of various management practices (fertilization, tillage, and conservational methods) specifically on P loss at field level. The objectives of this study include modeling the baseline phosphorous losses for the year 2023 and then predicting the advantages of adopting new practices for individual fields. This study aims to use monetary incentives provided to a small group of farmers for reducing P in their field. Multispectral drone imagery and digital elevation model along with field data (soil information, geolocation, daily weather) and surveys collected from farmers regarding specific fertilizer and manure application practices. We utilized Agricultural Policy/ Environmental Extender (APEX) model to simulate phosphorous loss using the aforementioned datasets. The preliminary result of the present study of four Virginia field of area ≤1.8 hectares shows that the total mineral P loss for year 2023 is 2.19, 2.33, 1.33 and 3.07 kg/ha and total organic P loss is 4.26, 3.3, 1.27 and 4.92 kg/ha respectively. Overall, it helps in creating a platform for farmers informed decision making process relating to P management in soil and tests whether performance-based mechanisms can work for protecting ecosystem services.

4. **Identifying Affinity for Technology Interaction amongst Certified Crop Advisors**

[1]**Shreya Mitra**, [2]*Maaz Gardezi*, [1]*Tom Archibald*
[1]Agricultural, Leadership and Community Education, [2]Sociology

In this era of Agriculture 4.0, where efficiency and accuracy has been the driving force behind technological innovation, significant efforts and investments has been put into creating agricultural decision support tools with an intent to help the agricultural community make data driven decisions. But there exists a certain level of hesitancy amongst the users that acts as a barrier for them to utilize these tools. The focus of this study is to understand how CCA engages with Decision Support Tools (DST). One way to understand crop advisors' engagement with DSTs is through the affinity for technology interaction (ATI) scale. This study makes use of 5-point ATI scale as a tool to understand Certified Crop Advisors (CCA) comfort level, proficiency, and willingness to engage with DSTs. Data for this study was collected via an online survey that was targeted towards the CCAs and was administered in the US, Canada, and Mexico in the year 2023. A total of 146 CCA's responded to the survey. Latent Class Analysis was used as a method to classify respondents based on their affinity to technology. Results show that there are three categories of crop advisors based on their reaction to the ATI scale. Findings from this study can help cooperative extension and other

stakeholders, such as technology developers understand the preferences of crop advisors around the use of DSS for them to provide customized support if and where necessary. By understanding technology engagement profiles for crop advisors, we aim to bridge the existing technological skill gap within the community of practice.

5. **Investigating the Transcriptomic Responses Linking Increased Biomass and Alterations in Mineral Nutrition due to Elevated CO2 in Soybean**

[1]*Ravneet Kau*r**, [2]*Mary Durstock*, [3]*Anna Lipzen*, [4]*Stephen A. Prior*, [4]*G. Brett Runion*, [5]*Elizabeth A. Ainsworth*, [6]*Ivan Baxter*, [3]*Alvaro Sanz-Sáez*, [1]*Courtney P. Leisner*

[1]School of Plant and Environmental Sciences, [2]Crop, Soil and Environmental Sciences, [3]US Department of Energy Joint Genome Institute, [4]National Soil Dynamics Laboratory, [5]Global Change and Photosynthesis Research Unit, [6]Donald Danforth Plant Science Center

Projected atmospheric CO2 levels are anticipated to surpass 650 parts per million (ppm) by the century's end due to continued fossil fuel usage. Elevated CO2 concentrations have been linked to increased biomass but decreased protein, nitrogen, and micronutrients. While the impact on biomass and nutrient accumulation has been extensively explored, the physiological mechanisms behind reduced mineral content and increased biomass remain unclear. This project seeks to empirically investigate mineral composition responses to elevated CO2 through field and growth chamber research, examining seven hypotheses related to lower nutritional content in plants grown in high CO2 conditions. In a 2021 open Top Chambers (OTC) experiment, soybeans (Clark, Flyer, Loda) were grown under ambient (~410 ppm) and high (~610 ppm) CO2 conditions. The selection of these cultivars was based on variations in their reactions to elevated CO2 levels with respect to yield and nutrient accumulation. During the growing season, analyses of carbon assimilation, stomatal conductance, and tissue nutrient content were conducted twice. Tissue samples were collected for RNA sequencing from leaves, pods, and roots. Results from this experiment aim to elucidate the complex relationship between physiological and molecular responses to high CO2 environments. Moreover, information from the growth chamber studies that follow and the OTC experiment will be essential in identifying the physiological mechanisms causing the nutrient content alteration in high CO2 environments. The current growth chamber experiments will also guide sampling for future field investigations. This research will provide molecular tools to develop better climate-resilient crops using soybean as a model plant.

6. **Agent-Based Modeling (ABM) to Investigate the Adoption of Precision Agriculture Technologies Among Iowa Farmers**

[1]*Indunil P. Dharmasiri*, [1]*Maaz Gardezi*, [1]*J. Arbuckle*
[1]Sociology

Precision agriculture technologies can significantly boost farm productivity. Understanding the factors influencing farmers' adoption of these precision agriculture technologies is crucial for maximizing their benefits. This study investigates the factors influencing Iowa farmers' adoption of precision agriculture technologies. Specifically, we will investigate how different data governance regimes influence farmers' adoption of precision agriculture under three distinct scenarios: (i) the consolidation of smaller farms into larger operations, (ii) reduction in technology costs accompanied by increased user-friendliness and (iii) the occurrence of prolonged droughts. To address these objectives, we will employ an Agent-Based

Model (ABM) since it can perform multiple simulations under diverse conditions to understand their collective impact by explicitly modeling relevant behaviors, environmental factors, and policy dynamics. Our ABM will forecast the adoption of specific precision agriculture technologies within three to ten years. In our model, the adoption of different precision agricultural technologies by farmers (agents) will be driven by (a) individual adoption behavior

7. **Identifying Promising Soybean Lines for Crossbreeding to Enhance the Efficiency of Soybean Meal Production to Boost Animal Performance**

[1]***Ayoyinka O. Okedigba***, [1]*Daniel G.S. Capelluto*, [2]*Maria L. Rosso*, [2]*Chao Shang*, [2]*Bo Zhang*, [3]*Daisy Yu*, [3]*Haibo Huang*
[1]Biological Sciences, [2]School of Plant and Environmental Sciences, [3]Food Science and Technology

Trypsin inhibitors (TIs) in soybeans restrain the activity of serine proteases like trypsin in the digestion of soybean proteins leading to indigestion and some unwanted physiological effects. We investigated how the main TIs in soybean meal samples, the Bowman-Birk trypsin inhibitor (BBTI) and the Kunitz trypsin inhibitor (KTI), restrict the activity of serine proteases with the major goal of identifying soybean lines with low affinity to trypsin for crossbreeding purposes. KTI and BBTI were purified and isolated from soybean meal lines using fast-protein liquid chromatography-propelled gel filtration. The identity, purity, and affinity of the TIs for trypsin, chymotrypsin, and elastase were determined through mass spectrometry-sequence analysis, SDS-PAGE, and isothermal titration calorimetry, respectively. We observed that BBTI showed a ten-fold higher affinity for trypsin compared to KTI, whereas KTI displayed a forty-fold stronger affinity for chymotrypsin than BBTI. We have identified a BBTI variant (KA= 769231 M-1) with a sixteen-fold reduced affinity for trypsin compared to the standard BBTI (KA=12500000 M-1) from Sigma and a KTI variant (KA=111111 M-1) with an eight-fold reduced affinity for trypsin compared to the standard KTI (KA= 833333 M-1) from Sigma. Taken together, our findings indicate that both KTI and BBTI exhibit preferences for specific serine proteases, making both TIs important in the regulation of these enzymes. Also, the success of this project will lead to the generation of a robust soybean meal that requires minimal processing prior to animal consumption.

8. **Characterizing Topographic Indices for Model Parametrization**

[1]***Binyam Asfaw***, [1]*Daniel Fuka*, [1]*Zachary Easton*
[1]Biological Systems Engineering

One important challenge for critical source management is field scale identification of soil wetness patterns. Several studies have used topographic indices (TI) to model wetness patterns. One approach has been using TI values for model parameterization -- where classifying TI values become a reasonable step to limit the number of unique landscape elements. However, there is a lack of recommendation on the optimum way for classification. In this work we used soil moisture data collected on 25 points across a 4-ha pasture field to inform TI classification. To identify soil wetness patterns clustering analysis is performed. The clustering analysis is used to identify multi-dimensional dissimilarities. The 25 soil moisture sampling locations form the number of observations and the days of sampling form the dimensions. We used Euclidean distance to calculate dissimilarities between soil moisture observations. The cluster analysis is based on k-means clustering. The optimum number of partitions are selected by using scree plot analysis. The outcome of the clustering analysis informed classification of TI values into classes. TI values are classified into the number of cluster groups identified from the clustering model. Using several classification approaches equal area, equal interval, and natural breaks three distinct TI classes are generated. Misclassification rate is then calculated by comparing the output of the clustering analysis, which is derived from measured soil moisture data, and class determination from the TI classification approaches. The analysis informed which TI classification approach provides optimum TI class characterization.

9. **Leveraging Deep Learning for Dollar Spot Detection and Quantification in Turfgrass**

[1]**Elisabeth Kitchin**, [1]*David McCall*
[1]School of Plant and Environmental Sciences

Dollar spot is one of the most economically significant diseases to turfgrass, resulting in financial implications for turfgrass managers when managed incorrectly. Accurate and efficient quantification of disease severity is vital for research and effective disease management. This project presents the development of a machine learning model designed to address these issues by analyzing image data to provide a means of disease identification and estimating disease coverage. Through extensive training on a diverse and comprehensive dataset, our machine learning model has achieved an accuracy and precision rate of 93% and 76%, respectively, in identifying and quantifying dollar spot disease. These metrics underscore the model's efficacy in recognizing and quantifying disease manifestation across various conditions. Leveraging deep learning techniques, the model identifies and delineates the spatial extent of dollar spots in turfgrass images, thus eliminating the inherent subjectivity in manual assessments. This model aids researchers and turfgrass managers by reducing the reliance on labor-intensive, manual assessments susceptible to observer bias. The automated nature of this machine-learning model fosters the standardization of disease quantification. It offers a tool for turf pathologists to make well-informed decisions regarding disease control and turfgrass maintenance.

10. **Farmers' Imaginaries of Post-Digital Farmer Identities Within Human-Technology Assemblages: Insights from Q-Methodology Approach**

[1]**Bhavna Joshi**, [2]*Edward Prutzer*, [1]*Awais Hameed Khan*
[1]Sociology, [2]Arts and Sciences, [3]Social Sciences

The future of agriculture is inextricably tied to farming technologies based on artificial intelligence and machine learning. Intensification of human and technology interaction is going to affect the existing relationships of farmers with experts assisting in their routine farm-based decision making. This paper uses the mixed-method approach of Q-methodology to identify future farmer identities as imagined by the farmers in the United States. We employ assemblages theory to situate the evolving farmer identities within the web of distributed human and non-human expertise in agriculture. The data were collected from design workshops and interviews conducted with farmers in Vermont and South Dakota in 2023. Dominated by an overarching techno-optimist sentiment, the results demonstrate four emerging farmer identities in the future: 1) Weather-shield sceptics; 2) Grid-mapping proponents; 3) Tech-traditionalists; and 4) Knowledge collaborators. The farmers positively speculate the use of advanced technology for nutrient management and emphasize on the need of a data-friendly infrastructure for technology adoption. Regardless of tech-positivism, most farmers are pessimistic about the future of weather shielding technology for farms.

11. Identifying Potential Parcels for Solar Farm Development in Central Virginia

[1]*Gabe Wiggins*, [1]*Michael Cary*, [1]*Susan Chen*, [1]*Samantha Rippley*
[1]Agriculture and Applied Economics

This project works to identify suitable sites for photovoltaic (PV) development in Goochland, Hanover, and Powhatan Counties surrounding Richmond, Virginia. With rapid increase in the development of renewable energy, strategic siting of PV parks is important to avoid diminishing quality agricultural land and ensure long-term food security. Through the use of geospatial data, we analyze land suitability, road access, and energy infrastructure proximity at the parcel level across each of these three counties. We leverage these insights to identify parcels with quality characteristics for PV parks as well as those which aren't situated on prime agricultural land.

12. DeepCow: Deep Learning-Powered Beef Cow Body Weight Estimation

[1]*Halah Shehada*, [1]*Sahilpreet Singh*, [2]*Gota Morota*, [1]*Sook Ha*
[1]Electrical and Computer Engineering, [2]Animal Sciences

Body weight estimation of beef cows is time-intensive and laborious. Directing the beef cows to the weigh scale can cause harm to the cattle and be stressful. Automatic weight estimation using computer vision systems offers a noninvasive and cost-effective solution. In this project, we develop a computer vision pipeline and propose a novel depth video data collection of beef cows from the Virginia Tech Beef Cow Center for 133 beef cows.
Data collection was conducted using RealSense D345 depth. The depth image frames were extracted from the video and then used in a computer vision pipeline to estimate the body weight of the beef cows. Initially, we performed background subtraction to isolate the cow's image from the background, followed by image segmentation through thresholding techniques. Subsequent steps included data normalization and noise reduction to refine the dataset. For feature extraction, we utilized advanced deep-learning models, namely ResNet50 and XceptionNet. Those features

with the given weight of each cow were then input into 3D Convolutional Neural Networks (3DCNN) and Fully Convolutional Neural Networks (FCNN) to estimate the weight of the cows. The experimental outcomes show that the integration of ResNet50-derived features with FCNN achieved an accuracy of 96.1%, coupled with a Mean Absolute Percentage Error (MAPE) of 3.8%, outperforming 3DCNN and features extracted from XceptionNet when applied to both FCNN and 3DCNN.

Thank you!

Dr. Robin White
CAIA Associate Director
Associate Professor
School of Animal Sciences

Dr. Will Singer
CAIA Program Manager

Maddie Baldwin
VAES/CAIA Administrative Assistant

College of Agriculture and Life Sciences

Graduate student professional development (5-7:30 pm, **March 28**, location: GLC)

5:00 - 5:45 PM   Dinner

5:45 - 7:30 PM   Professional development activities:

- "You have you PhD, now what?" (Panel discussion)
- "Cultivating Audience Connections for Science Engagement" (seminar)

Graduate student poster session (Wallace Hall Atrium, 8:30 AM -12:00 PM, **March 29**)

8:30 - 9:00 AM   Breakfast

9:00 - 9:30 AM   Morning Graduate Student Mixer

9:30 - 10:15 AM   Poster Session I (15 posters)

10:25 - 11:10 AM   Poster Session II (12 posters)

11:10 AM - 12:00 PM Lunch, Trivia, and poster award announcement

Best graduate student poster awards:

1st place ($300):

2nd place ($150):

3rd place ($100):

Faculty/posdoc/staff retreat (1:00 PM – 4:30 PM)

1:00 - 1:05 PM   ***Welcome*** (Dr. Kang Xia, Director for CAIA)
1:05 - 1:15 PM   ***VAES update and vision*** (Dr. Mary Burrows, Associate Dean for Research and Director for VAES, CALS)
1:15 – 1:25 PM   ***VCE update and vision*** (Dr. Mike Gutter, Director of VCE, Associate Dean for Extension, CALS)
1:25 – 2:00 PM   ***CAIA update*** (CAIA Leadership Team)
2:00 – 2:10 PM   **Break**
2:10 – 3:10 PM   **Fellowship of VT Centers**
       2:10 – 2:20 PM Sanghani Center for Artificial Intelligence and Data Analytics (Brian Mayer, Program Manager)
       2:20 – 2:30 PM Center for Food Systems and Community Transformation (Kim Niewolny, Director)
       2:30 – 2:40 PM Center for Educational Networks and Impacts (Lisa McNair, Director)
       2:40 – 2:50 PM Center for Future Work Places and Practices (Ralph Hall, Associate Director)
       2:50 – 3:00 PM Macromolecules Innovation Institute (Bob Moore, Director)
       3:00 - 3:10 PM Institute for Advanced Learning and Research (Scott Lowman, Vice President of Applied Research)
3:10 – 4:00 PM **Targeted breakout discussion topics:**
- Opportunities for cross-center collaborations?
- Path forward for CAIA?

4:00 – 4:20 PM **Breakout session reports**
4:20 – 4:30 PM **Conversation**

VAES update and vision

Dr. Mary Burrows, Associate Dean for Research and Director for VAES, CALS

VCE update and vision

Dr. Mike Gutter, Director of VCE, Associate Dean for Extension, CALS

CAIA Update

CAIA Leadership Team

CAIA's Mission:

To leverage science and technology to create transformative solutions to support agriculture and food systems, the environment, and communities in the Commonwealth and beyond.

Short-Term Milestones
(within the first 5-years)

Jan, 2021 ─── **Dec, 2025**

DEVELOP	ESTABLISH	CREATE	EXPAND
· Leadership and administrative structure · Competitive seed funding RFA · Ongoing affiliate faculty seminars, workshops, and team building	· Platform Teams · Interdisciplinary graduate education program · Annual seminar and training series · External Advisory Council	· Partnerships between CAIA, CCI-affiliated universities, and industry · External Communications Network Workforce training	· Pursue large Center and Research Grants · Increase overall funding and technology capacity · Partnerships and Impacts

CAIA's key accomplishments:

- 170+ affiliated faculty across VT

- 30+ affiliated graduate students across VT

- CAIA affiliate faculty proposal submission:
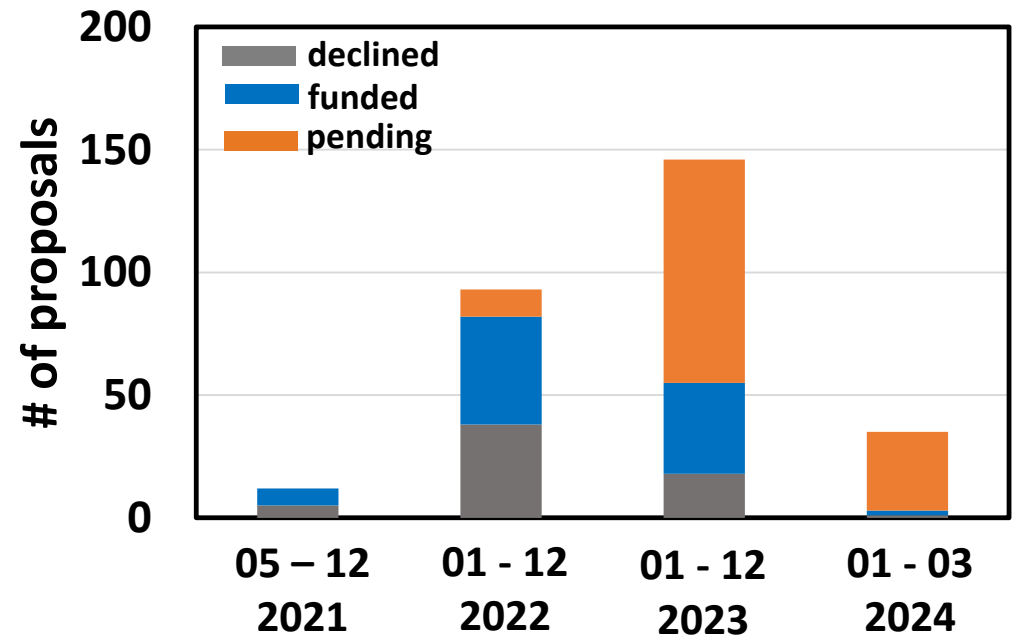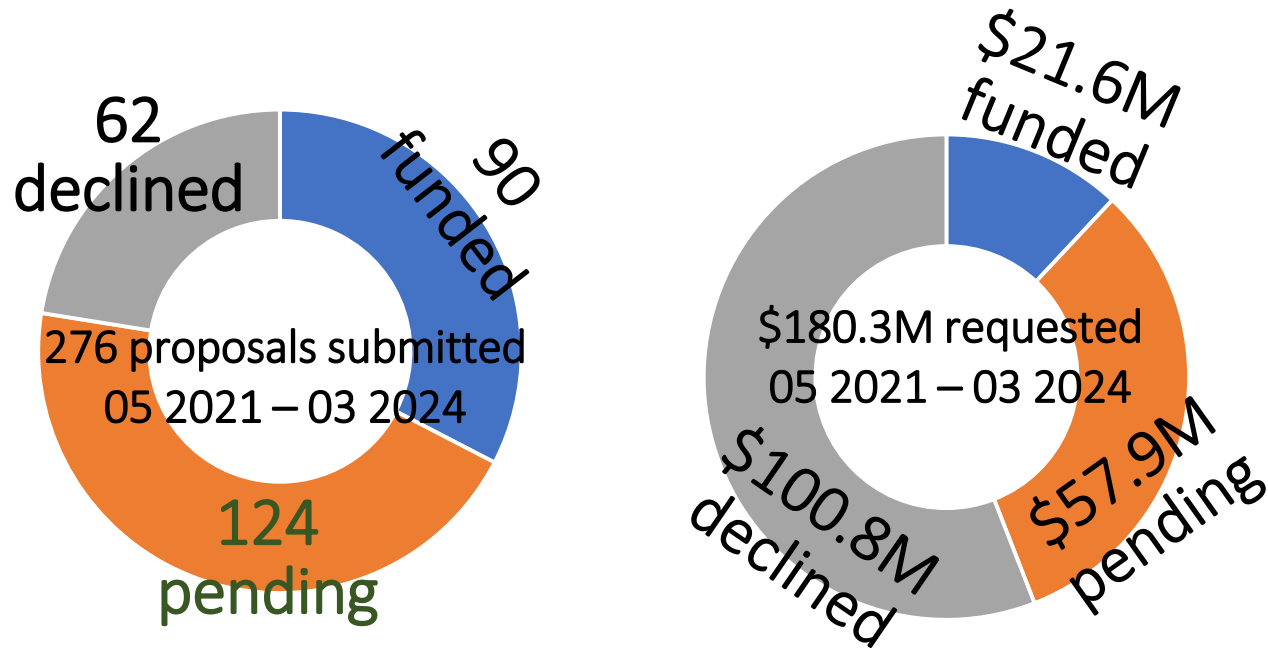
- Contracts/donation received by CAIA:

  - NSF Convergence Accelerator Track J Food & Nutrition Security: Precision Agriculture for a Resilient Vegetable Supply Amidst Climate Change (Precision Ag4Veggie). NSF, Award # 49100423C0009, $750,000, 01/2023 – 12/2023.
    Lead: Virginia Tech Applied Research Corporation (VT-ARC); co-Lead: CAIA (VT portion of budget: $313,032).

  - Preliminary Cyberbiosecurity Case Studies. Accenture. $75,000 (08/2023-08/2024)

- New initiatives:

  - Agricultural Biotechnology (Ag-Biotech) → $100M BioMADE concept proposal / $24M NSF Biofoundry proposal → Bioeconomy

    Faculty leaders: Zhiwu Wang, Haibo Huang, Clay Wright, Anna Duraj-Thatte, Ryan Senger, Robin White
    Supporting Unit Leaders: Dwayne Edwards, Renee Boyer, Michael Schwarz

    - 1 workshop
    - VT DA 2.0 proposal
    - 1-2 NSF proposals
    - 1 USDA proposal
    - 1 Summit in July 2024

  - Agrovoltaic →
    - 1 workshop
    - VT DA 2.0 proposal
    - 1-2 NSF proposals
    - 1 USDA proposal
    - 1 Summit in 2024

    Faculty leaders: Robin White adn Ralph Hull

  - Cyberbiosecurity in Agriculture →
    - 1 workshop (April 1 2024)
    - 5-university consortium

    Faculty leader: Feras Batarseh

Ag Security Coalition
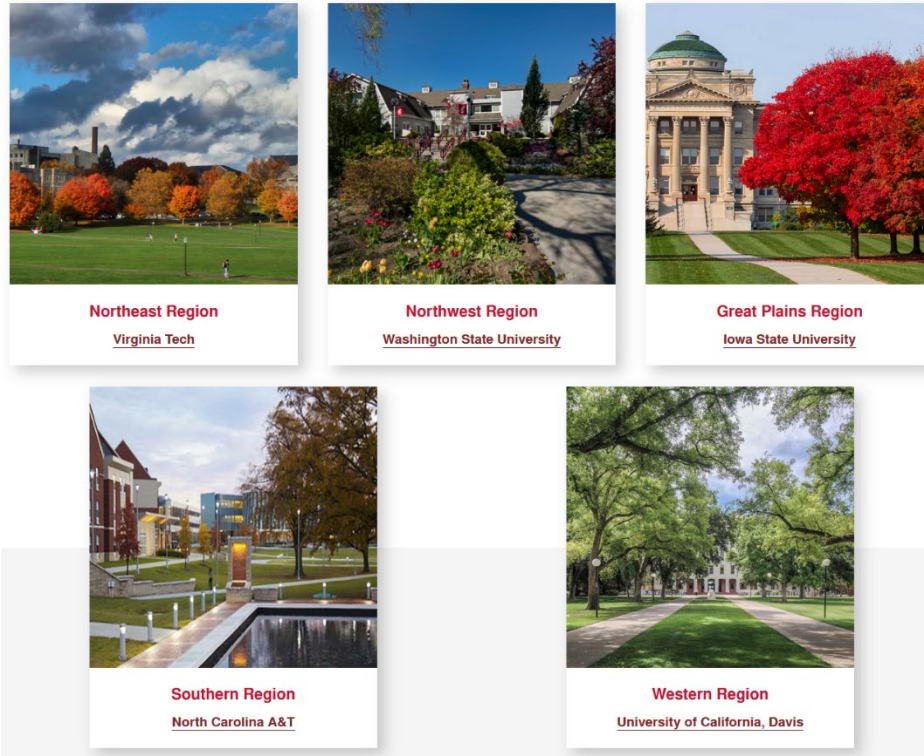
- National Workshop on Feb 14, 2024
- White paper to USDA and Congressional Agriculture committee
- Hub and node funding (land grant universities)
- Industry and academic partners per node
- Orchestrating Cyberbiosecurity efforts at/via CAIA (April 1st workshop)
- Cyberbiosecurity platform (& new committee) at CAIA

Founded in 2000, the mission of the Information Technology-Information Sharing and Analysis Center (IT-ISAC) is to grow a diverse community of companies that leverage information technology and have in common a commitment to cybersecurity, and serve as a force-multiplier that enables collaboration and sharing of relevant, actionable cyber threat information, effective security policies, and practices for the benefit of all. The IT-ISAC augments member companies' internal capabilities by providing them access to curated cyber threat analysis, an intelligence management platform, and a trusted forum to engage with senior analysts from peer companies. The IT-ISAC global membership base consists of leading companies from three critical infrastructure sectors: IT, food and agriculture, and elections. The IT-ISAC is recognized by the Department of Homeland Security and the IT Sector Coordinating Council as the IT sector's designated information-sharing forum, and has helped industry and government respond to the world's most significant cyberattacks over the past two decades.

Ag - Information Sharing and Analysis Center.

Legislation Relating to Ag Cybersecurity

> H.R. 4387, the Cybersecurity in Agriculture Act

>> Sponsored by Rep. Zach Nunn (R-IA-03) and Rep. Don Davis (D-NC-01)

>> "The Cybersecurity in Agriculture Act will enhance cyberattack readiness, response, and recovery by establishing five Regional Agriculture Cybersecurity Centers"

> **H.R.3809 - Cybersecurity for Rural Water Systems Act**

>> Sponsored by Rep. Donald Davis (D-NC-1)

>> Introduced in 2023

> Opportunities in the Farm Bill

>> 5-year authorization for U.S. agriculture policy. And a "Must-pass" legislation

>> Vehicle to address this important issue facing agriculture

> Other aspects and opportunities

>> WH National Cybersecurity Strategy – March 2023

>> Multiple AI initiatives and acts

>> Agriculture, Homeland Security, other?

Involved VT Institutes and Centers
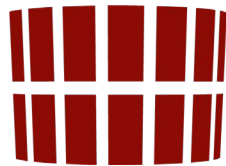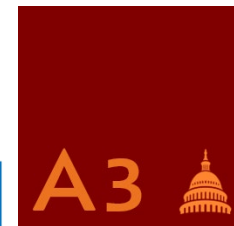
VT's Cyberbiosecurity *Program*?

- Multiple test-beds, labs, and resources
- Focused courses
- Ag-ISAC founding member
- Workforce development
- Research & leadership in the NE region
- Annual cyberbiosecurity workshop
- Learning-living cyber communities
- Industry partnerships
- Others…

- 13 CAIA sponsored events
- CAIA sponsored or co-sponsored seed grants and research opportunities:
  - ***Susan Duncan Innovation in Agriculture Seed Grant*** (joint supported by CAIA/ICAT/VT-ARC) – 2 proposal teams were selected to receive phase 1 fund
    - ✓ *Microplastics as a Conduit for Plant Pathogen Transport and Enrichment in Agricultural Systems* (Drs. David Schmale, Hosein Foroutan, Austin Gray)
    - ✓ *Cultivating Science Communicator Identities: Increasing Agricultural Scientists' Identity-Based Motivation to Communicate Through Identity Modeling and Training* (Drs. Jean Parrella, Hannah Sunderman, Patty Raun, Carrie Kroehler)
  - ***CAIA/Sanghani Center Joint Graduate Scholarship*** – 2 were awarded in spring 2024:
    - ✓ **Runing Yang** (co-faculty advisors: Drs. Jin Ming and Haibo Huang) "LLM Assisted Meta-analysis for Agricultural Science"
    - ✓ **Sangwoo Kim** (co-faculty advisors: Drs. Venkataramana Sridhar and Anuj Karpatne) "Predicting Future Droughts and Their Impact on Salinity and Rice Production in the Lower Mekong River Basin Using Hybrid Deep Learning Approach"
  - ***Graduate Affiliate Travel Awards*** – 6 graduate students were awarded to attend five national conferences in Spring 2024
  - **CAIA Assessment** – David Smilnak's Ph.D research project   Phase 2 – in-person interview with CAIA faculty

Faculty feedback in 2023:

- Hire a Program Coordinator
- Facilitate Collaborations
- Enable Grant Submissions
- Support Student Recruitment
- Pioneer Transdisciplinary Education
- Engage Industry and Community
- Targeted efforts to support new faculty
- Refine & Refocus Website

Dr. Will Singer
CAIA Program Manager
wilmsing@vt.edu

Dr. Zach Brown
Associate Director
of Business
Development, LINK

CAIA leadership and administrative structure:

CALS Leadership

Executive Committee —— CAIA (Director, Associate Director) —— External Advisory Board
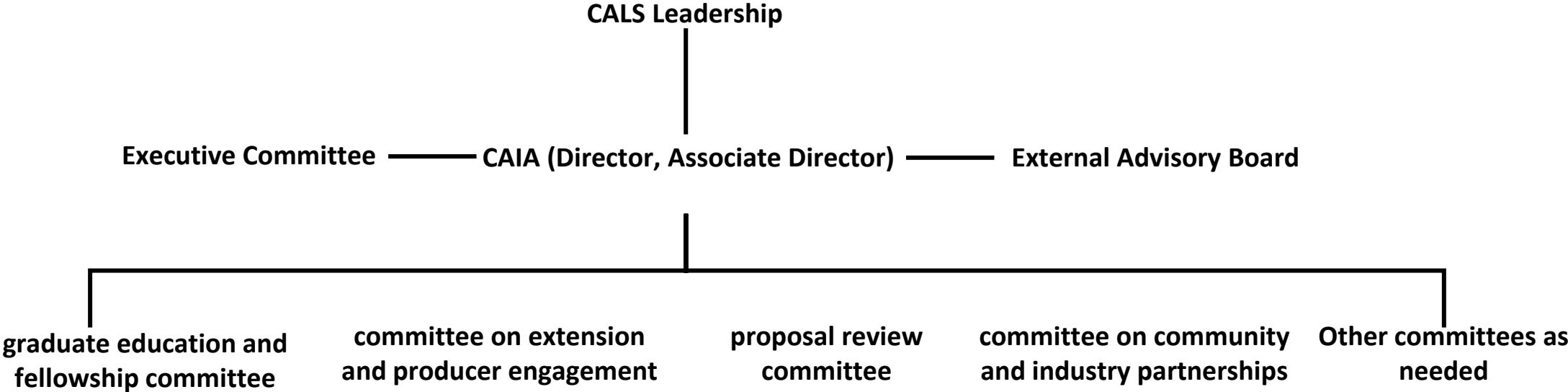
graduate education and fellowship committee

committee on extension and producer engagement

proposal review committee

committee on community and industry partnerships

Other committees as needed

Ongoing Projects

Travel Support

CAIA/Sanghani
Scholarship

Graduate
Certificate

Upcoming Opportunities

- June 1: CAIA/Sanghani Fellowship Applications (Fall 2024)
  - Two April planning opportunities

- May 17th: Travel awards supporting travel occurring between June 1 and January 31, 2014

Who is Eligible?

Stakeholder feedback sessions

➢HRAREC - nursery crops

➢EVAREC - grain crops

➢TAREC - cotton/peanut

➢SPAREC - tobacco/livestock

➢Growers, extension agents, industry stakeholders

Role of VT / VCE

➢ Disconnect between academia & real world; specialists & agents

➢ Growers need ROI before investing in technology
   ➢ Frustrating for growers that VT has not come up with this
   ➢ Growers need 3rd party, unbiased data
   ➢ Need extension to verify new technologies; *aerial rates for chemicals
   ➢ Most precision ag training come from fellow growers or tech salesmen

➢ Growers want open dialect; campus, agents, growers
   ➢ Agents need support & resources
   ➢ Producers are asking questions agents can't find faculty to answer
   ➢ Growers want researcher site visits to present info in casual setting

➢ Lost of research at VT, but not applied
   ➢ Need applicable data to make profitable & good decisions

Partnership between Growers & Faculty

➢ Digital outreach: text, email, YouTube links

➢ On-farm research, farm visits, see technology in action

➢ Field days, grower meetings, scheduled webinars, round tables

> ➢ Material needs to be of interest to producers
>
> ➢ Manage time well
>
> ➢ Don't have in times that conflict with field work

Top Needs

➤ Mechanization & automation to reduce labor costs
  ➤ University research; things created & not commercialized, difficult to implement

➤ Analysis, ROI, economic impact of new technology
  ➤ Need financial numbers to make decisions to implement

➤ Variable rate lime, fertility, seeding; how planter down pressure affects emergence

➤ Rates for spray drones

➤ Robotic tobacco topper and transplanter (mechanization/labor)

➤ VT soils lab not utilized to slow turnaround, results sheet

Build the team

➤ Economist

➤ Agronomist

➤ VCE agent

➤ Roboticist

➤ Civil / mechanical engineer

➤ Need to be reviewed by grower!

Do you need help with your proposal?

- Proposal Review from experts at VT
  - Proposal review before submission
    - Provide a draft of your proposal two weeks before the due date and we can review for you. In addition, if you would like a particular type of expertise we can find a reviewer for you from CAIA members or at the university
    - Only 1 proposal was reviewed so far this year- please reach out and we can set up a review!

- Need to brainstorm ideas?
  - We can set up a discussion between you and other experts at VT to help focus and refine your ideas for proposals and research questions

Resources

- Available to CAIA members on the website

  - Templates and forms for
    - NIH,
    - NSF, and
    - USDA grants

  - Coming soon- NASA, DOE, and EPA

Help with the process of submission

Summit- Proposals, Agreements, All internal to VT (https://summit.cloud.vt.edu/)

Cayuse- Software that communicates with Grants.gov, used for NIH, USDA, DOE, others, communicates externally (https://www.research.vt.edu/era/cayuse-424.html)

Research.gov- for NSF grants and reporting, communicates externally (https://www.research.gov/research-web/)

ezFedGrants- communicates externally (https://www.usda.gov/ocfo/ezfedgrants)

Select CAIA on Summit

Faculty/posdoc/staff retreat (1:00 PM – 4:30 PM)

1:00 - 1:05 PM   ***Welcome*** (Dr. Kang Xia, Director for CAIA)

1:05 - 1:15 PM   ***VAES update and vision*** (Dr. Mary Burrows, Associate Dean for Research and Director for VAES, CALS)

1:15 – 1:25 PM   ***VCE update and vision*** (Dr. Mike Gutter, Director of VCE, Associate Dean for Extension, CALS)

1:25 – 2:00 PM   ***CAIA update*** (CAIA Leadership Team)

2:00 – 2:10 PM   **Break**

2:10 – 3:10 PM   **Fellowship of VT Centers**

      2:10 – 2:20 PM Sanghani Center for Artificial Intelligence and Data Analytics (Brian Mayer, Program Manager)

      2:20 – 2:30 PM Center for Food Systems and Community Transformation (Kim Niewolny, Director)

      2:30 – 2:40 PM Center for Educational Networks and Impacts (Lisa McNair, Director)

      2:40 – 2:50 PM Center for Future Work Places and Practices (Ralph Hall, Associate Director)

      2:50 – 3:00 PM Macromolecules Innovation Institute (Bob Moore, Director)

      3:00 - 3:10 PM Institute for Advanced Learning and Research (Scott Lowman, Vice President of Applied Research)

3:10 – 4:00 PM **Targeted breakout discussion topics:**

- Opportunities for cross-center collaborations?
- Path forward for CAIA?

4:00 – 4:20 PM **Breakout session reports**

4:20 – 4:30 PM **Conversation**

Faculty/posdoc/staff retreat (1:00 PM – 4:30 PM)

1:00 - 1:05 PM   *Welcome* (Dr. Kang Xia, Director for CAIA)
1:05 - 1:15 PM   *VAES update and vision* (Dr. Mary Burrows, Associate Dean for Research and Director for VAES, CALS)
1:15 – 1:25 PM   *VCE update and vision* (Dr. Mike Gutter, Director of VCE, Associate Dean for Extension, CALS)
1:25 – 2:00 PM   **CAIA update** (CAIA Leadership Team)
2:00 – 2:10 PM   **Break**
2:10 – 3:10 PM   **Fellowship of VT Centers**
      2:10 – 2:20 PM Sanghani Center for Artificial Intelligence and Data Analytics (Brian Mayer, Program Manager)
      2:20 – 2:30 PM Center for Food Systems and Community Transformation (Kim Niewolny, Director)
      2:30 – 2:40 PM Center for Educational Networks and Impacts (Lisa McNair, Director)
      2:40 – 2:50 PM Center for Future Work Places and Practices (Ralph Hall, Associate Director)
      2:50 – 3:00 PM Macromolecules Innovation Institute (Bob Moore, Director)
      3:00 - 3:10 PM Institute for Advanced Learning and Research (Scott Lowman, Vice President of Applied Research)
3:10 – 4:00 PM <mark>**Targeted breakout discussion topics:**</mark>
- Opportunities for cross-center collaborations?
- Path forward for CAIA?

4:00 – 4:20 PM **Breakout session reports**
4:20 – 4:30 PM **Conversation**

The Sanghani Center @ Virginia Tech

Naren Ramakrishnan – Director

Chris North – Associate Director

Chang-Tien Lu – Associate Director

Brian Mayer – Project Manager/Research Scientist

VIRGINIA TECH

SANGHANI CENTER FOR ARTIFICIAL
INTELLIGENCE & DATA ANALYTICS

Overview

- Research center focused on data science, ML, and knowledge discovery in key areas of national interest
  - intelligence analysis, sustainability, urban computing, and health informatics

- Our work emphasizes not just the algorithmic aspects of converting data to knowledge but also the importance of human-in-the-loop analytics to arrive at insights. Incremental human learning & incremental model learning

- People
  - 25 academic faculty
  - 4 research faculty
  - 4 administrative support
  - 115 grad students (90 PhD)
  - 10 undergrad students

- Locations
  - Blacksburg, VA (Main Campus)
  - Northern Virginia
    - Arlington
    - Falls Church
    - Alexandria (Innovation Campus)

V⫟ VIRGINIA TECH

SANGHANI CENTER FOR ARTIFICIAL INTELLIGENCE & DATA ANALYTICS

Center Faculty and Areas

Statistics
Leanna House
Scotland Leman

ECE
A. Lynn Abbott
Ruoxi Jia
Ming Jin

Math
Mark Embree
Layne Watson

Computer Science
Hoda Eldardiry
Edward A. Fox
Lenwood Heath
Lifu Huang
Anuj Karpatne
Ismini Lourentzou
Chang-Tien Lu
Chris North
Naren Ramakrishnan
Chandan Reddy
Eugenia Rho
Chris Thomas
Xuan Wang
Pinar Yanardag
Daphne Yao*
Dawei Zhou

ISE
Manish Bansal

VTTI
Abhijit Sarkar*

Research Faculty
Patrick Butler
Nathan Self
Brian Mayer
Rebecca Faust

* Indicates Affiliate
Sanghani Faculty vs Core
Sanghani Faculty

Research Areas
Computer Vision/Image Processing
Science-Guided Machine Learning
Privacy/Trustworthy AI
Natural Language Processing
Multimodal Fusion
Spatial/Temporal Analytics
Forecasting
Social Networks
Urban Analytics
IoT and CPS
Information Retrieval
Network Analysis
Explainability
Visual Analytics
Optimization
Bayesian Statistics
Cyber Security

SANGHANI CENTER FOR ARTIFICIAL
INTELLIGENCE & DATA ANALYTICS

Sanghani Center Sponsors (Federal)

Sanghani Center Sponsors (Industrial)

Sanghani Center Sponsors (Other)

Educational Programs

- Graduate Certificate in Data Analytics (w/STAT/ECE)

- Graduate Certificate in Urban Computing (w/MATH/STAT/ECE/PHS/CEE/SOC/UAP)

- Master of Engineering w/ a concentration in Data Analytics and Artificial Intelligence

- MS and PhD in CS

- Masters in Information Technology w/ a concentration in Business Analytics and Business Intelligence (supporting CoB)

UrbComp

- PhD program focused on data analytics in urban computing

- Participating Departments
  - Horizontals: CS, MATH, STAT, ECE
  - Verticals: Epidemiology (PHS), Transportation (CEE), Sustainability (ECE), Social Sciences (SOC), and Urban Planning (UAP)

- ULL (Urban Living Lab)
  - Provides practicum experiences to students
  - Liaise with industry, government, and end-consumers
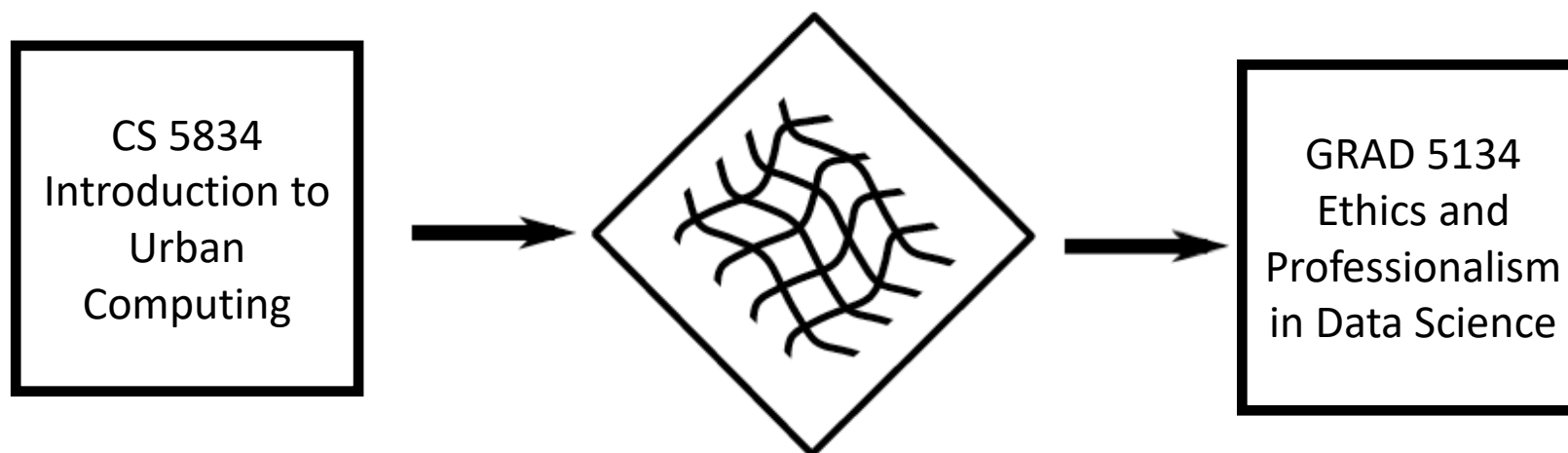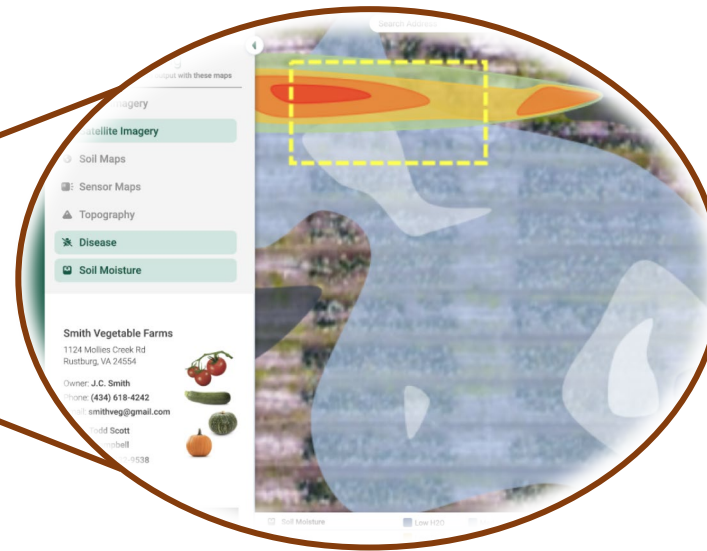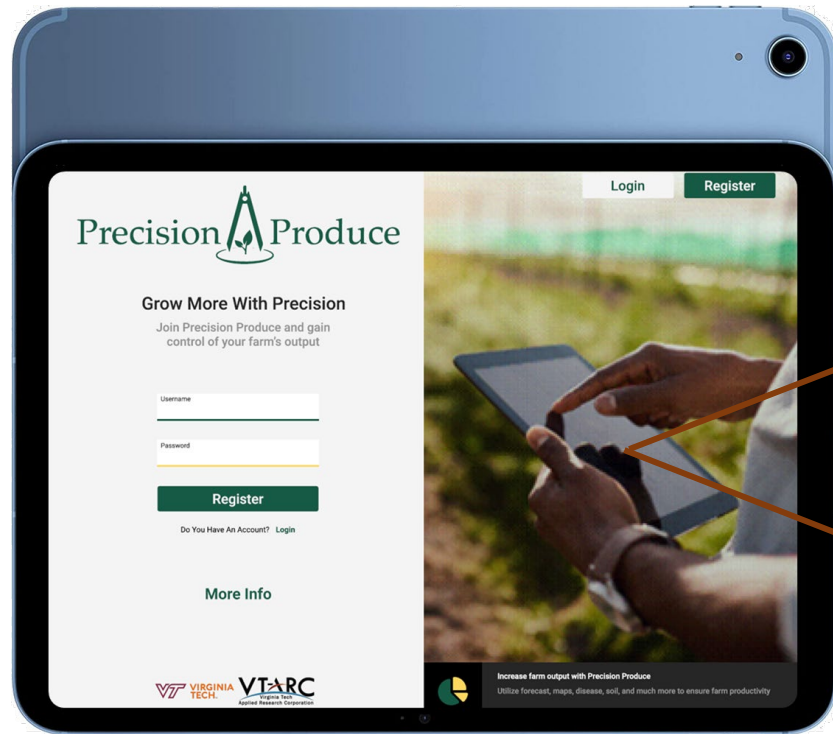
CAIA Scholarship

- CAIA/Sanghani Center Joint Graduate Scholarship
  - 2 years of funding (+1 year from advisors) for awarded Ph.D. students
  - Students are co-advised by a CAIA and a Sanghani faculty member
  - Research with relevance to both CAIA and the Sanghani Center priorities
- Sponsored 2 students starting Spring 2024
  - Sangwoo Kim, Advisors: Venkataramana Sridhar (BSE) and Anuj Karpatne (CS)
    - Predicting Future Droughts and Their Impact on Salinity and Rice Production in the Lower Mekong River Basin Using Hybrid Deep Learning Approach
  - Runing Yang, Advisors: Ming Jin (ECE) and Haibo Huang (FST)
    - LLM Assisted Meta-analysis for Agricultural Science
- Planning 2024 Fall GRA Awards (1 or 2 awards)
  - Potential Sanghani/CAIA Mixer

VIRGINIA TECH

SANGHANI CENTER FOR ARTIFICIAL INTELLIGENCE & DATA ANALYTICS

Amazon - Virginia Tech Initiative for Efficient and Robust Machine Learning

Development and implementation of innovative approaches to robust machine learning, such as ensuring that algorithms and models (like LLMs) are resistant to errors and adversaries.

- Collaboration
  - Shared Advisory Board
  - 4 VT and 4 Amazon

- Outreach:
  - Machine Learning Day
  - Amazon, VT, and broader community

- Research
  - Yearly funded research projects
  - Yearly graduate fellowship

VIRGINIA TECH

SANGHANI CENTER FOR ARTIFICIAL INTELLIGENCE & DATA ANALYTICS

amazon alexa

AI Testing and Deployment

- Large Language Models (LLMs), and generative AI more broadly, are becoming ubiquitous

- BUT there are many risks to using LLMs, e.g., inaccurate, insecure, biased

- We're creating methods for identifying and rectifying issues, e.g., AI red-teaming

LLM

LLM
Critic
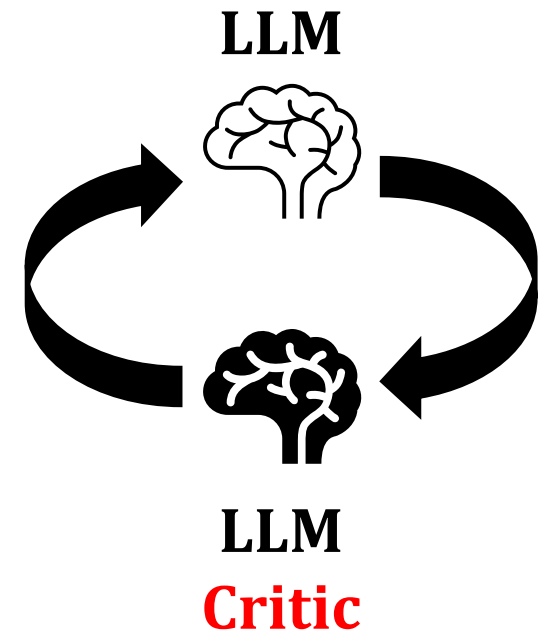
Children's National Hospital

- VT and CNH have a joint biomedical research facility within the Children's National Research & Innovation Campus

- The goal of our collaboration is to advance innovation in AI/ML to support research in pediatric health and rare diseases

- Seed funding was provided by both Virginia Tech and Children's National Hospital to ignite collaborations that grow into larger impactful endeavors

VIRGINIA TECH

SANGHANI CENTER FOR ARTIFICIAL INTELLIGENCE & DATA ANALYTICS

CENTER FOR FOOD SYSTEMS AND COMMUNITY TRANSFORMATION

VIRGINIA TECH®

We work at the nexus of food, agriculture, and society to explore and catalyze the conditions for a more just and sustainable food system so that all may thrive.

SOCIAL EQUITY ~ RESILIENCY~FOOD ACCESS ~SOIL HEALTH ~

SUSTAINABILITY~FOODWAYS

Our Aims

- Address food system complexities through programs, outreach, and partnerships.

- Conduct community-based food systems research.

- Enhance curriculum in food systems with community-university learning goals.

Virginia Cooperative Extension Model
Community, Local, & Regional Food Systems

CENTER FOR FOOD SYSTEMS AND COMMUNITY TRANSFORMATION

VIRGINIA TECH®

Anchor Programs

o The Virginia Beginning Farmer & Rancher Coalition (VBFRC)

o AgrAbility Virginia

o Virginia Farm to Table

o Equitable Food Value Chain Coordination

o Community, Local, and Regional Food Systems (CLRFS) Program Team of Virginia Cooperative Extension

o Southern Sustainable Agriculture Research and Education (SARE)

Projects & Initiatives

- National Urban Agriculture Initiative

- Advancing Urban Agriculture and Sustainable Food Systems in Virginia

- Roanoke Foodshed Network

- Soil for Water

- Community-based Health Equity Research to Increase Farm Worker and Agricultural Laborer Health, Safety, and Wellness in Virginia

- 4 the Soil: A Conversation

- Southeast Regenerative Grazing Project

- Expanding the Agroforestry Regional Knowledge Exchange Network in Virginia

- Supporting Food System Resilience in Central Appalachia: A Participatory Policy Project

- Stories of Community Food Work

National Urban Agriculture Initiative

Advancing Urban Agriculture and Sustainable Food Systems in Virginia

Community-based Health Equity Research to Practice Initiative to Increase Farm Worker and Agricultural Laborer (FW&AL) Health, Safety, and Wellness in Virginia

Cultural Community Development

"Five Articles Worth Reading" & News Archive

Food Systems Curriculum at Virginia Tech

Partners and Professional Societies

Food Equity & Justice Organizations

Bi-Monthly Update & Listserv

Graduate Learning Circles

Fellow's Talks

Collaboration and Resources

VT COLLEGE OF AGRICULTURE AND LIFE SCIENCES
VIRGINIA TECH.
CENTER FOR FOOD SYSTEMS AND COMMUNITY TRANSFORMATION

The Center for Food Systems and Community Transformation is offering a monthly fellow speaker series. Join us in September!

Dr. Marcus Comer & Dr. Leonard Githinji
College of Agriculture, Virginia State University

Agriculture in the Urban Landscape: Rooted in Sustainability and Resiliency

By drawing upon the conceptual frameworks of sustainability and community resiliency, this month's Fellow speakers will jointly share their research and extension programming in urban agriculture in Virginia. Marcus Comer, Associate Professor and Local Food Systems Specialist with the College of Agriculture at Virginia State University, and Leonard Githinji, Associate Professor and Extension Specialist of Sustainable & Urban Agriculture at Virginia State University, will together provide an overview of their programming in community and institutional gardening, urban farming, container gardening, indoor gardening, and the use of hydroponics and aquaponics systems. They will conclude with lessons learned to integrate cultural, social, and ecological principles and practices for healthy, just and sustainable urban landscapes.

September 29, 2021 2-3 PM ET
Visit this link for details and registration:
https://ti...
Email garlandm@...

VT COLLEGE OF AGRICULTURE AND LIFE SCIENCES
VIRGINIA TECH.
CENTER FOR FOOD SYSTEMS AND COMMUNITY TRANSFORMATION

The Center for Food Systems and Community Transformation is offering a monthly fellow speaker series. Join us in October!

Dr. Vivica Ingrid Kraak
Department of Human Nutrition, Food, & Exercise, Virginia Tech

The United Nations Food Systems Summit 2021: Understanding the Controversy About the Structure, Governance Process and Outcomes that Led to Protests and Boycotts

Dr. Vivica Kraak, Associate Professor in the Department of Human Nutrition, Food, and Exercise at Virginia Tech will explore the controversy and rationale for the protests by several groups to boycott the UN Food Systems Summit, organize a parallel Summit, and engage in social media activism. Dr. Kraak will also discuss the type of "game changing" actions and outcomes one could expect from the UN Summit.

October 27, 2021 2-3 PM ET
Visit this link for details and registration:
https://...
Email ga...

VT COLLEGE OF AGRICULTURE AND LIFE SCIENCES
VIRGINIA TECH.
CENTER FOR FOOD SYSTEMS AND COMMUNITY TRANSFORMATION

The Center for Food Systems and Community Transformation is offering a monthly fellow speaker series. Join us this month!

DR. NICK COPELAND
ASSOCIATE PROFESSOR, DEPARTMENT OF SOCIOLOGY, VIRGINIA TECH

COOPERATIVE EXTENSION AND THE COMING TRANSITION

Covid 19 has exacerbated structural inequalities and shone a spotlight on vulnerabilities endemic in food, economic, and community systems, compounding growing concerns about environmental sustainability and racial justice. In this talk, Dr. Copeland, a cultural anthropologist, will make the case for expanding on cooperative extension programs that are already responding to these interconnected crises to build more just and sustainable systems into the future.

JANUARY 27, 2021 | 2-3 PM

VT COLLEGE OF AGRICULTURE AND LIFE SCIENCES
VIRGINIA TECH.
CENTER FOR FOOD SYSTEMS AND COMMUNITY TRANSFORMATION

The Center for Food Systems and Community Transformation is offering a monthly fellow speaker series. Join us this month!

JENNY SCHWANKE & LAINA SCHNEIDER
BLACKSBURG COMMUNITY GARDEN COORDINATOR & MILLSTONE KITCHEN MANAGER
LIVE, WORK, EAT, GATHER, INC.

CULTIVATING COMMUNITY THROUGH FOOD AND GARDENING

In this discussion moderated by Center director, Dr. Kim Niewolny, Jenny Schwanke, Blacksburg Community Garden Coordinator, and Laina Schneider, Manager of Millstone Kitchen, will share reflections on the critical role of communities working together to create sustainable, community-based food systems. At the heart of the discussion is the importance of building local capacity, grassroots leadership, and community-university engagement in community food growing, sharing, cooking, and organizing. As community food leaders in Southwest Virginia, Jenny and Laina will illustrate their ideas and hopes for the future with examples from the Blacksburg Community Gardens and...

For m...

VT COLLEGE OF AGRICULTURE AND LIFE SCIENCES
VIRGINIA TECH.
CENTER FOR FOOD SYSTEMS AND COMMUNITY TRANSFORMATION

The Center for Food Systems and Community Transformation is offering a monthly fellow speaker series. Join us this month!

DR. OZZIE ABAYE
PROFESSOR, SCHOOL OF PLANT AND ENVIRONMENTAL SCIENCES, VIRGINIA TECH

FOLLOWING OUR FOODWAYS: PERSPECTIVES ON SUSTAINABLE FOOD SYSTEMS EDUCATION FROM FIELD TO KITCHEN

In this presentation, Dr. Ozzie Abaye will talk about the ways she incorporates culinary and food systems perspectives into her teaching and outreach as a form of sustainable food systems education. Dr. Abaye will also offer insights into the implementation of the Global Food Security and Health Pathway Minor program in the College of Agriculture and Life Sciences at Virginia Tech, including the considerations for domestic and international experiential education that emphasizes the nexus of food, agriculture, and society.

MARCH 24, 2021 | 2-3 PM EST
REGISTER FOR THE EVENT HERE:
HTTPS://TINYURL.COM/2MDUP56W

For more information or support please contact garlandm@vt.edu

---

VT COLLEGE OF AGRICULTURE AND LIFE SCIENCES
VIRGINIA TECH.
CENTER FOR FOOD SYSTEMS AND COMMUNITY TRANSFORMATION

The Center for Food Systems and Community Transformation is offering a monthly fellow speaker series. Join us this month!

DR. MAE HEY
ASSISTANT PROFESSOR, DEPARTMENT OF SOCIOLOGY, VIRGINIA TECH

THIS IS HOME: A FACILITATED DISCUSSION ON LAND-CENTERED LEARNING

Following a short film about the program, Dr. Hey will facilitate a discussion about a land-centered learning program she has developed at Virginia Tech that helps those living on this occupied land grow in knowledge, wellness, empowerment, community, and sustainability, especially during this past year of isolation and civil unrest. It is the life-giving energy of Shkakmikwe, Mother Earth, that allows for this teaching, learning, and healing.

FEBRUARY 24, 2021 | 5-6 PM EST
REGISTER FOR THE EVENT HERE:
HTTPS://TINYURL.COM/YY4ZT286

For more information or support please contact garlandm@vt.edu

---

VT COLLEGE OF AGRICULTURE AND LIFE SCIENCES
VIRGINIA TECH.
CENTER FOR FOOD SYSTEMS AND COMMUNITY TRANSFORMATION

The Center for Food Systems and Community Transformation is offering a monthly fellow speaker series. Join us in September!

Dr. Sarah Misyak
Assistant Director and Program Manager for Research and Evaluation
Family Nutrition Program (EFNEP and SNAP-Ed)
Virginia Cooperative Extension

Virginia Food Security Status During the COVID-19 Pandemic: An Assessment by the Virginia Family Nutrition Program

During the COVID-19 pandemic with rising under and unemployment rates, the Virginia Cooperative Extension Family Nutrition Program assessed food security status of SNAP-eligible individuals in Virginia. Dr. Sarah Misyak, the Assistant Director and Program Manager for Research and Evaluation for the Family Nutrition Program will present the results of this food security assessment and implications for the state of Virginia.

September 1, 2021 3-4 PM ET:
Visit this link for details and registration:
https://tinyurl.com/sarahmisyak
Email garlandm@vt.edu with any questions or concerns

VT COLLEGE OF AGRICULTURE AND LIFE SCIENCES
VIRGINIA TECH.
CENTER FOR FOOD SYSTEMS AND COMMUNITY TRANSFORMATION

The Center for Food Systems and Community Transformation is offering a monthly fellow speaker series. Join us in December!

Dr. Jessica Agnew & Dr. Ralph Hall
Center for International Research, Education and Development, Virginia Tech & School of Public and International Affairs, Virginia Tech

Exploring the Use of Blockchain Technology to Improve Food Security Through African Indigenous Vegetables in Western Kenya

Blockchain technology is heralded for its ability to improve traceability, trust, and trust in agri-food value chains. For the optimist and the skeptic of blockchain, we explore the complexities of using this emerging technology to strengthen agri-food value chains to create social and nutritional impacts. This one-hour talk will explore research results and lessons from the field in Western Kenya as to how blockchain might be used as a tool to improve food and nutrition security, women's leadership, and youth engagement within the value chains for African indigenous vegetables.

December 8, 2021 2-3 PM ET
Visit this link for details and registration:
https://tinyurl.com/hallagnew
Email garlandm@vt.edu with any questions or concerns

Fellow Speaker Series & Graduate Learning Circles

Left Poster

Join the Center for Food Systems and Community Transformation

Roundtable Discussion with Varkey George

Founder of Oshun South Africa

April 3, 12:00-1:30 pm ET

Graduate Life Center
155 Otey St, Blacksburg, VA 24060, Meeting Room B

Visit this link for details and registration:
https://tinyurl.com/CFSCTRoundtableVarkey

In coordination with the Global Education Office, the VT Center for Food Systems and Community Transformation is hosting a roundtable discussion with scholar and international development practitioner, Varkey George, founder of Oshun South Africa. Well-known for his public scholarship, study abroad programming, and community development initiatives across South Africa, Varkey's interests focus on global citizenship, poverty alleviation, and social entrepreneurship with partners worldwide. Through Oshun South Africa, Varkey recently collaborated with Virginia Tech's College of Agriculture and Life Sciences to hold a winter session experiential learning study abroad program in South Africa.

All graduate students and faculty are welcome to join Varkey George in a roundtable discussion hosted by the Center for Food Systems and Community Transformation to be held in the GLC on April 3rd, 12 to 1:30 pm. Lunchtime refreshments will be provided Space is limited, so please RSVP.

● ● ● ● ● ● ● ● ● ● ● ●

If you are an individual with a disability and desire an accommodation, please contact David Smilnak at davids21@vt.edu 540-231-4582 during regular business hours at least 10 days prior to the event.

Virginia Cooperative Extension is a partnership of Virginia Tech, Virginia State University, the U.S. Department of Agriculture, and local governments. Its programs and employment are open to all, regardless of age, color, disability, sex (including pregnancy), gender, gender identity, gender expression, national origin, political affiliation, race, religion, sexual orientation, genetic information, military status, or any other basis protected by law.

Right Poster

Join us for our April Center Fellows Speaker Series:

Sustainability and Agroecology in South Africa: Reflections on Community-Based Service Learning

Dr. Ozzie Abaye
Professor, School of Plant and Environmental Sciences

Dr. Pete Ziegler
Assistant Professor of Practice, College of Agricultural and Life Sciences

Evan Stanfield
Senior, Environmental Horticulture Major

Emma Cleveland
Senior, Systems Biology Major

Grace Bartlett
Senior, Crop & Soil Environmental Sciences Major

April 10, 2:00-3:00 pm ET

Visit this link for details and registration:
http://tinyurl.com/CFSCTAprilFellowTalk

In this session, students and faculty will reflect on their recent experience participating and leading an international experiential learning opportunity to South Africa focusing on the interface of agroecology, food security, and sustainable development. The session will discuss the interdisciplinary and participatory nature of the course and how the unique, community-partner course design provided opportunities for critical exploration of the realities of urban and rural food security and land use in South Africa. Student presenters will also reflect on their experience working with community partners and their specific projects throughout the semester-long course, and their perceptions after visiting each community partners' projects.

● ● ● ● ● ● ● ● ● ● ● ●

If you are an individual with a disability and desire an accommodation, please contact Katie Trozzo at ketrozzo@vt.edu 540-231-4582 during regular business hours at least 10 days prior to the event.

Email ketrozzo@vt.edu with any questions or concerns.
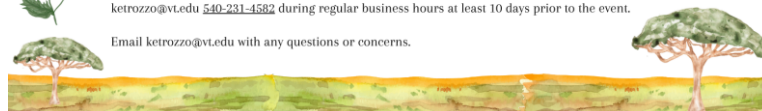
Eric Bendfeldt
Associate Director

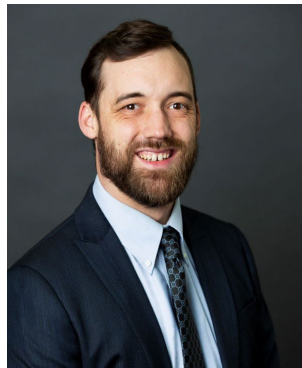Lia Kelinsky-Jones,
Postdoctoral Fellow

Kim Niewolny
Director

Katie Trozzo
Center Associate

Justice Madden
Graduate Fellow for Outreach
Bi-Monthly Updates

David Smilnak
Graduate Fellow for Research
Graduate Learning Circles

Stephanie Zhu
Graduate Fellow for Research
5 Weekly Readings

CAIA

March 20, 2024

Lisa McNair
Deputy Executive Director, ICAT
Professor, Engineering Education

CENI Educator Liaison Network

Liaisons work with both Virginia Tech and the regional formal and informal education community, including museums and school systems.

Jamie Little
OFFICE/ORGANIZATION

ORGANIZATION
Radford City Public Schools | Virginia Tech

Don Pizzullo
OFFICE/ORGANIZATION
Virginia Tech Roanoke Center

ORGANIZATION
Virginia Tech

Ashley Sloan
OFFICE/ORGANIZATION
Virginia Tech Roanoke Center

ORGANIZATION
Virginia Tech | Ashley Sloan

Sarah Wray
OFFICE/ORGANIZATION
Reynolds Homestead

ORGANIZATION
Virginia Tech

Kim Keith
OFFICE/ORGANIZATION
CENI Center for Educational Networks a...

ORGANIZATION
Floyd County Public Schools

Megan Atkinson
OFFICE/ORGANIZATION
Pulaski County Public Schools

ORGANIZATION
Pulaski County Public Schools

Chris Savage
OFFICE/ORGANIZATION
Science Museum of Western Virginia

ORGANIZATION

Melanie Gilbert
OFFICE/ORGANIZATION
Reynolds Homestead

ORGANIZATION
Virginia Tech

Nora Bolte
OFFICE/ORGANIZATION
Wonder Universe, A Children's Museum

ORGANIZATION
Wonder Universe

Caitlin Thorn
OFFICE/ORGANIZATION
Center for Educational Networks and Im...

ORGANIZATION
Giles County Public Schools

Lori Mitchell
OFFICE/ORGANIZATION
New River Community College

ORGANIZATION
New River Community College
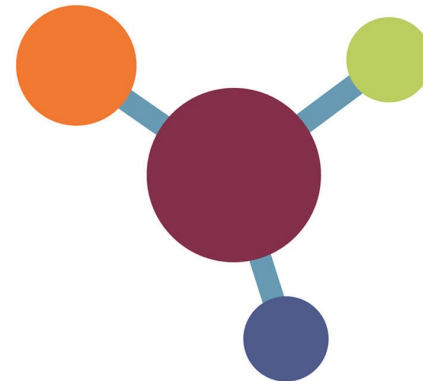
Collaborative Research Support

At the Center for Educational Networks and Impacts, we consult with researchers on broader impact design, data management plans, and external evaluation.

Adapting to Climate Change
The Sep 8 CENI / ICAT Playdate featured "Adapting to Climate Change: Embracing Transformation through Data-Driven Innovation." This project is a NSF Convergence collaboration with VT-ARC leading a transdisciplinary team of researchers.

Precision Produce
Grow more with Precision

VT-ARC
Dell
VIRGINIA WESTERN The Community's College

VT | CENTER FOR ADVANCED INNOVATION IN AGRICULTURE
VT | SCHOOL OF PLANT AND ENVIRONMENTAL SCIENCE
VT | CENTER FOR GEOSPATIAL INFORMATIONS TECHNOLOGY
NORTH CAROLINA AGRICULTURAL AND TECHNICAL STATE UNIVERSITY

VT | CENTER FOR ECONOMIC AND COMMUNITY ENGAGEMENT
VT | CENTER FOR EDUCATIONAL NETWORKS AND IMPACTS
VT MID-ATLANTIC AVIATION PARTNERSHIP VIRGINIA TECH.
AERIAL VANTAGE

VT SANGHANI CENTER FOR ARTIFICIAL INTELLIGENCE & DATA ANALYTICS VIRGINIA TECH.
Virginia Employment Commission
Office of the Governor of Virginia Secretary of Administration Deputy Secretary of Cybersecurity

With collaborators across campus and beyond (CAIA, CECE, CGIT, the Sanghani Center, VT ARC, and NC State) we're going to share the exciting work of cybersecurity in our agricultural technology research at a Hokie for a Day field trip and at the VT Science Festival. Please join us with your research and outreach! To learn more and apply:
Virginia Tech Science Festival Information and Application
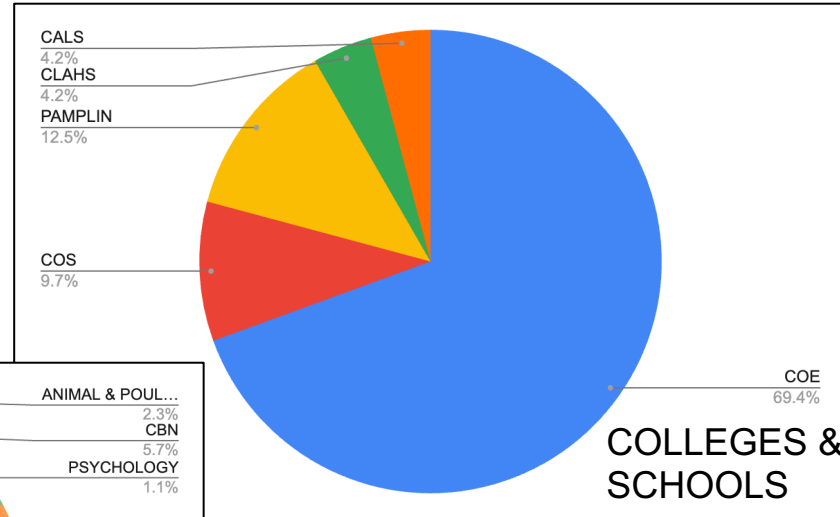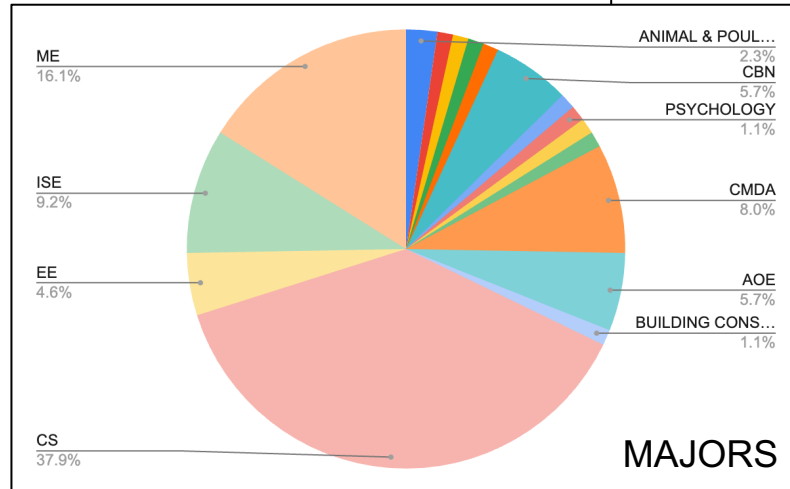
Science Festival – Virginia Tech
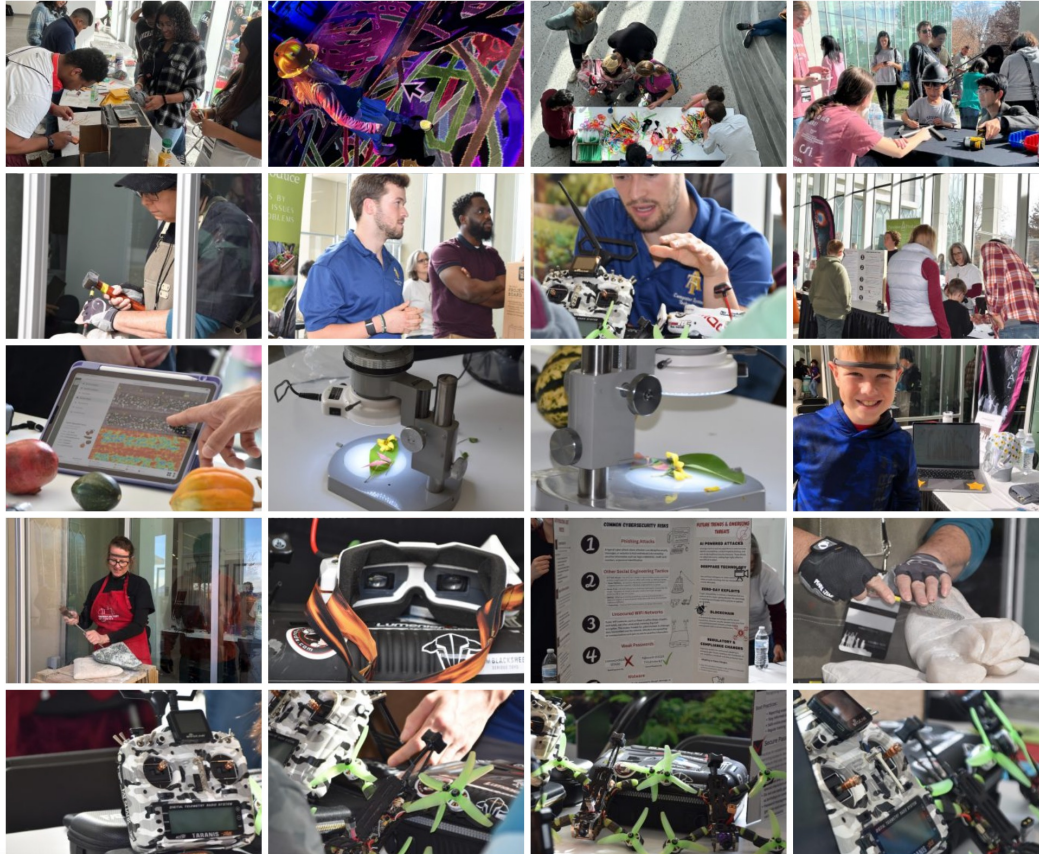
Science Museum of Western Virginia
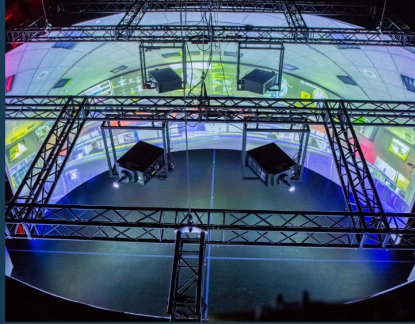
IDPro – Interdisciplinary Projects (ENGE 2964/4964)

Pilot: Fall 2023 – Spring 2024

ANIMAL & POULTRY SCIENCE	2
FOOD SCIENCE	1
CRIMINOLOGY	1
SOCIOLOGY & POL SCIENCE	1
STATISTICS	1
CBN	5
PHYSICS	1
PSYCHOLOGY	1
ECON	1
CMA	1
CMDA	7
AOE	5
BUILDING CONSTRUCTION	1
CS	33
EE	4
ISE	8
ME	14
	87

COLLEGES & SCHOOLS

CALS 4.2%
CLAHS 4.2%
PAMPLIN 12.5%
COS 9.7%
COE 69.4%

MAJORS

ME 16.1%
ISE 9.2%
EE 4.6%
CS 37.9%
ANIMAL & POUL... 2.3%
CBN 5.7%
PSYCHOLOGY 1.1%
CMDA 8.0%
AOE 5.7%
BUILDING CONS... 1.1%

IDPro – Interdisciplinary Projects (ENGE 2964/4964)

| |
|---|
| AI and Education |
| Aircraft Cabin Accessibility: Equity, Inclusivity, and Neurodiversity |
| Automatic Measurement of Plant Growth through Computer Vision Analysis |
| Automatic Nutrient Solution Management System for Hydroponics |
| Autonomous Rural Trash Collection |
| Carving out Creativity: Brain Activity while making Art |
| De-Palletizer Optimization |
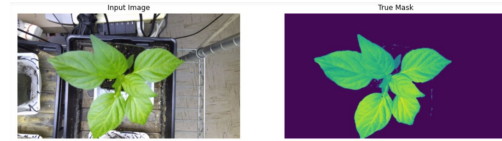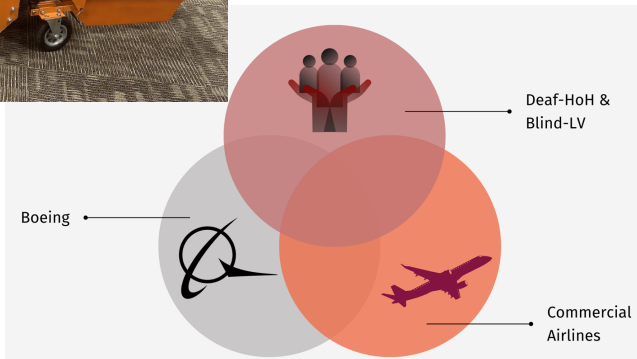
IDPro – Interdisciplinary Projects (ENGE 2964/4964)
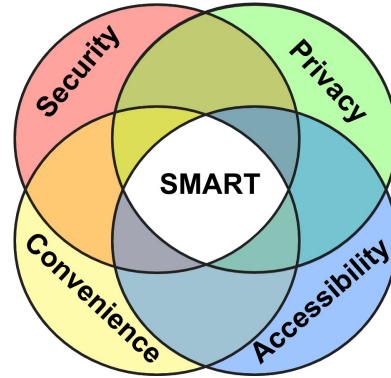
GobblerBot Food Delivery
Huckleberry Trail Counter
Magnetothermal
Navigation Kiosk
Phased Array Microphonics
Pork Belly Press Energy Analysis
Software Managed Arduino-based Residential Toolkit (SMART)
Understanding the Undergraduate Middle Year Slump

School of Plant and Environmental Sciences
Bingyu Zhao – Faculty Coach in Interdisciplinary Projects:

Automatic Measurement of Plant Growth through Computer Vision Analysis

Automatic Nutrient Solution Management System for Hydroponics

Students:
Joohyun Park, Sr CS A-F 3 cr
Surya Kotera, Jr CS P/F 1 cr
Arav Singh, Soph CS P/F 1 cr

Jiayao Wang, Sr CS Vol
Junjie Lin, Jr CS Vol
Patrick Beurline, Jr CS P/F 1 cr
Hamza Iqbal, Soph CS A-F 2 cr
Gautam Iyer, Jr CMDA P/F 1 cr
Bjorn Pace, Jr Mech Egr A-F 2 cr

https://tinyurl.com/3dat2nwh

https://tinyurl.com/58r6a34n

IDPro – Interdisciplinary Projects (2964/4964 – Field Study)

- Experiential Learning
- Vertically Integrated Projects
- Project-Based Learning
- Focus on students in middle years
- Interdisciplinary Teams
- Diverse Portfolio
  - Department, faculty, community, industry
  - Faculty Coach for each team
  - Graduate Assistant

Kolb's Experiential Learning Theory
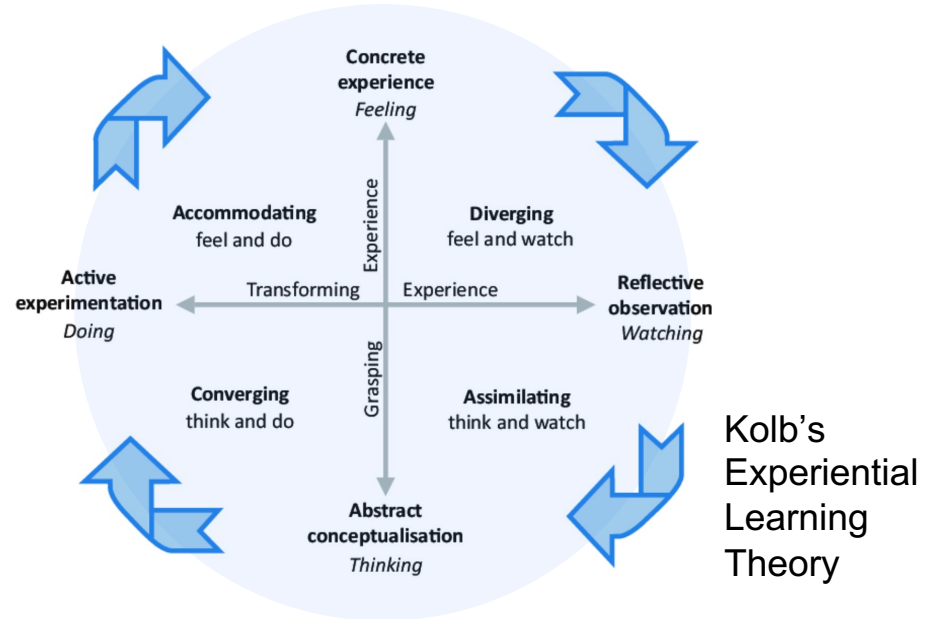
"Experiential learning is a constructivist learning theory defined as 'learning by doing'.
The learner is an active participant in the educational process,
and learning is achieved through a continuous cycle of
inquiry, reflection, analysis and synthesis"
(Bartle, 2015)

ICAT Funding

Fall 2024
- Student – up to $1,000
- Mini – up to $6,000
- Jones/CENI Educator Grant – up to $3,000
- HBCU Collaboration – up to $20,000 Research Leave Extension

Spring 2025
- Susan E. Duncan Innovation in Agriculture Seed Grant
- Major – up to $25,000

Food Security: Agriculture, Engineering, and the Art of Food in a Culturally-Relevant Context

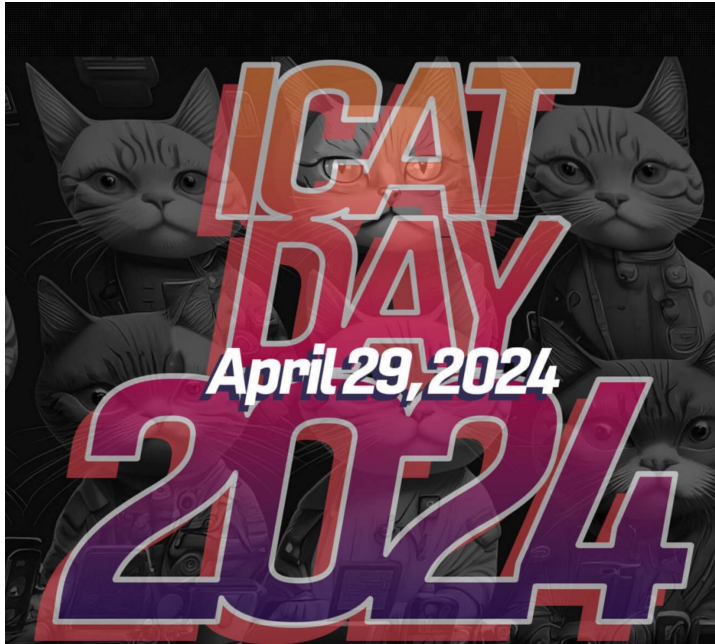Food Security: Food Availability, Access to Food, and Food Use

Ozzie Abaye, School of Plant and Environmental Sciences

ICAT DAY 2024
Monday, April 29, 2024
10am — 2pm
Followed by a reception at 2:15 in the Cube

ICAT Playdates
Fridays
8:30am Donuts
9-9:30am Presentation
Creativity & Innovation District

ICAT Playdate — Immersive audio and visual simulation in healthcare
April 5, 2024

www.foodsystems.centers.vt.edu

@VTFOODSYSTEMS

Center for Future Work Places and Practices (CFWPP): An Introduction

March, 2024

Background

- New technologies are poised to change the future of work and the workplace

- **Future of Work** at the Human-Technology Frontier is one of the [10 Big Ideas for NSF Investments](#)

- Since 2017, VT faculty have been awarded 14 awards worth almost $13 million from NSF's [Human Technology Frontier](#) program

INSTITUTE FOR CREATIVITY, ARTS, AND TECHNOLOGY
CENTER FOR FUTURE
WORK PLACES AND PRACTICES
VIRGINIA TECH.

Vision of the Center

CFWPP's vision is to be an international leader in research and education exploring the complexities of a future of work that is

- **creative** (in process)
- **integrated** (in discipline)
- **inclusive** (of identities and viewpoints)
- **distributed** (in space and time)
- **equitable** (in its distribution of ownership and income)
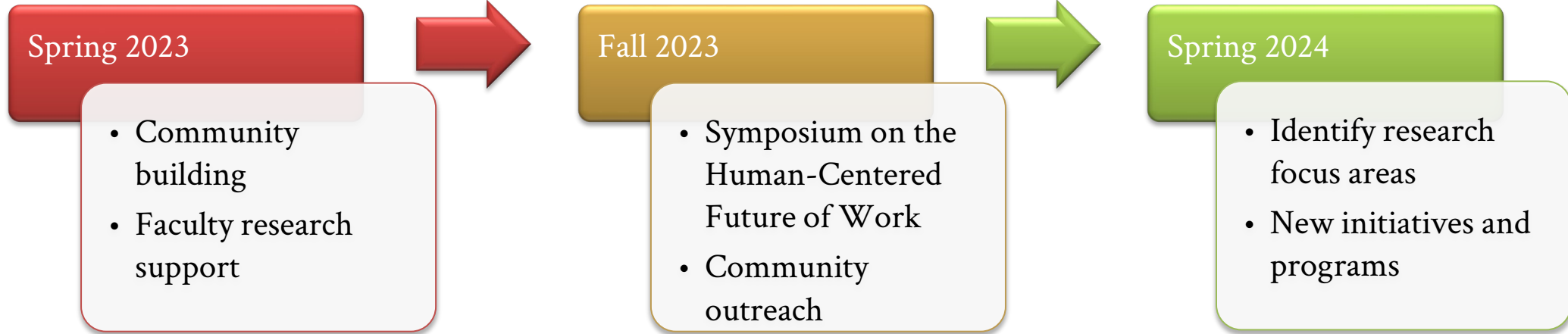- **symbiotic** (with technological, institutional, organizational, and social innovation)

CFWPP: Center "History"

- Launched in January 2023, supported by the Office of Vice President of Research and Innovation

- An institute-level center in the Institute for Creativity, Arts, and Technology (ICAT)

- An interdisciplinary center that integrates research and education perspectives to enhance the impact of emerging technologies on the future of work

Timeline

Spring 2023
- Community building
- Faculty research support

Fall 2023
- Symposium on the Human-Centered Future of Work
- Community outreach

Spring 2024
- Identify research focus areas
- New initiatives and programs

Who We Are

The center has 50+ affiliated faculty members across Virginia Tech

Kereshmeh Afsari
Doug Bowman
Chris Brown
Ricardo Coleman
James Kong
Nathan Lau
Sol Lim
Xu Lin
Wenqi Shen
Ashley Shew
David Wang
Christopher Williams
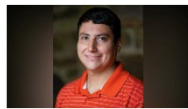
Brendan David-John
Adrienne Edisis
Andrew Gipe-Lazarou
Kaveh Akbari Hamed
Dylan Losey
Kurt Luther
Tom Martin
Sharon Mastracci
Daron Williams
Ryan Williams
Craig Woolsey
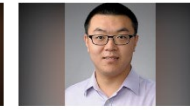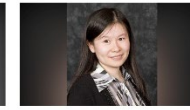Xiguang Xu

Grant Hamming
Ivan Hernandez
Gil Hersch
Louis Hickman
Na Meng
Lisa McNair
Jian Ni
Maury Nussbaum
Wenjie Xiong
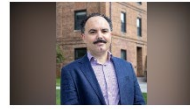Yaxing Yao
Yang (Cindy) Yi
Mengxi Zhang

Bo Ji
Sylvester Johnson
Andrew Katz
Brook Kennedy
Besnik Pula
Angela Scarpa
Abhijit Sarkar
Arianna Schuler Scott
Dawei Zhou
Yaoyi Zhou
Meng Zhu
Qin Zhu

Research Projects Funded by CFWPP (Examples)

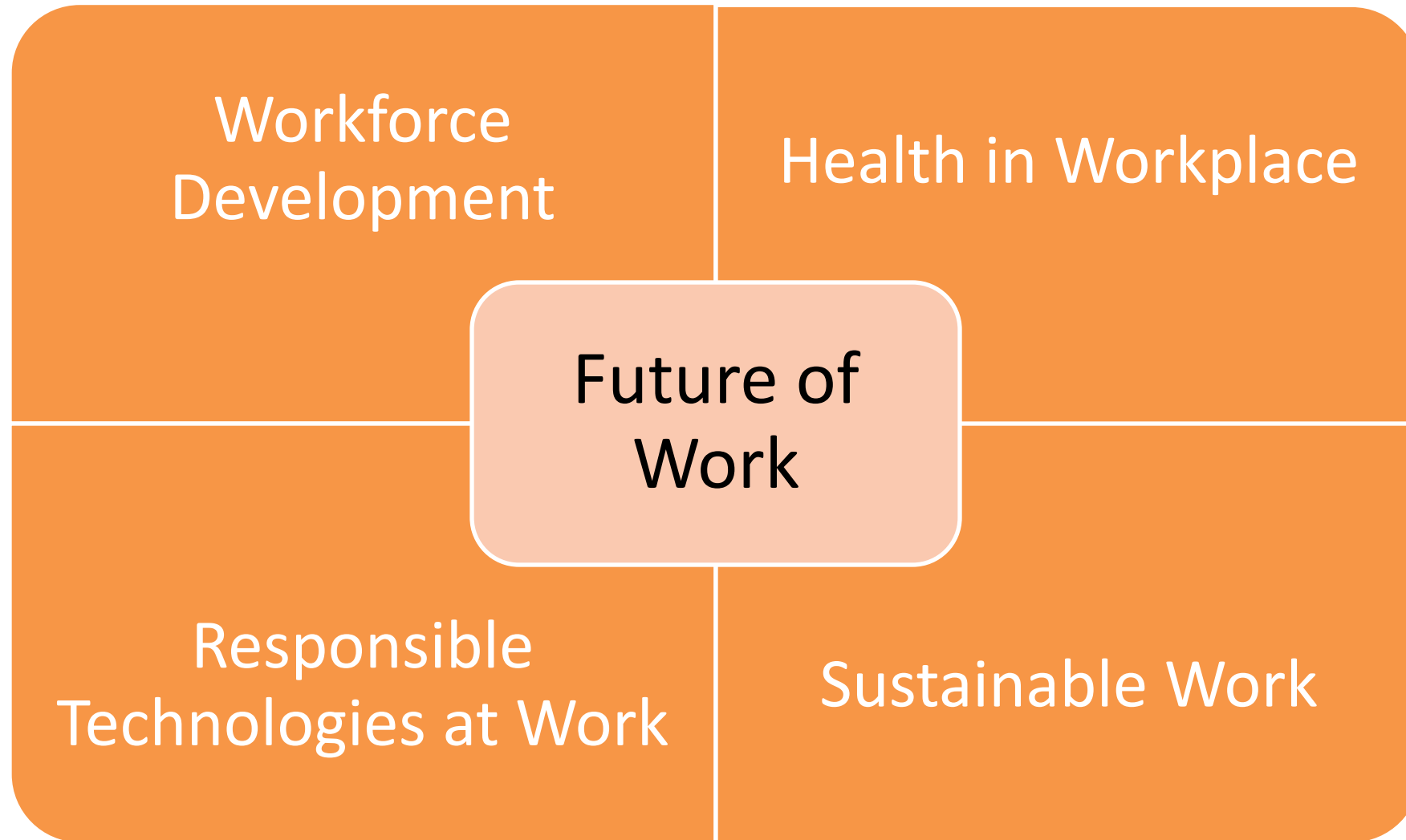Securing Trustworthy XR Interactions through Human-Machine Networks in Healthcare

3D Printed Ceramic Partitions for Evaporative Cooling

SafeNavigator: Vision-Impaired Navigation with Safety Alerts

INSTITUTE FOR CREATIVITY, ARTS, AND TECHNOLOGY
CENTER FOR FUTURE
WORK PLACES AND PRACTICES
VIRGINIA TECH

Research Focus Area: Workforce Development

- Collaboration with the US-Japan University Partnership for Workforce Advancement and Research & Development in Semiconductors, also known as the *UPWARDS for the Future* program on workforce development/women in semiconductors

- Russell Sage Foundation Future of Work Program

Research Focus Area: Health in Workplace

- Proposals submitted to [4-VA Collaborative Research Grant](#)

- Plan to submit a [Destination Areas 2.0](#) Planning and Development Grant

Research Focus Area: Sustainable Work

- Collaborations with [Center for Advanced Innovation in Agriculture (CAIA)](#) on multiple projects

- Plan to submit an Agrivoltaics [Destination Areas 2.0](#) Planning and Development Grant

- NSF [BioFoundries](#) proposal – "A Catalyst for a Sustainable Food and Agriculture-Based Bioeconomy in Mid-Atlantic Region (Bio-ATLANTIC)"

Initiatives and Programs

- Speaker series

- FOW Student Summer Research Scholarship (funded by donation)

- Summer seed grants

- Other faculty support

Partners

Building Synergy Between MII and CALS

(CAIA Big Event   March 29, 2024)

MACROMOLECULES INNOVATION INSTITUTE
VIRGINIA TECH.

Dedicated to Advancing Fundamental Knowledge and Technical Innovations in Macromolecular Science and Engineering

MII Mission and Vision

MII is a University-wide Center-of-excellence and reports to the Office of the Vice President of Research and Innovation (OVPRI). It is guided by a Stakeholders Committee and an External Advisory Board.
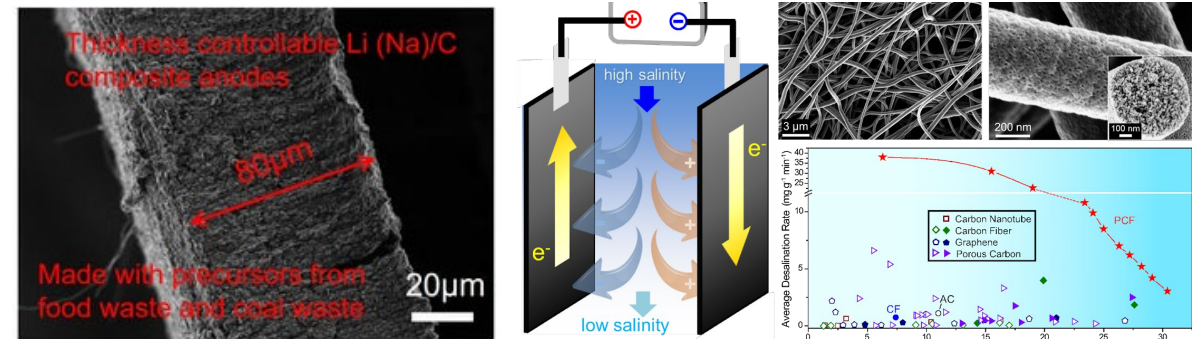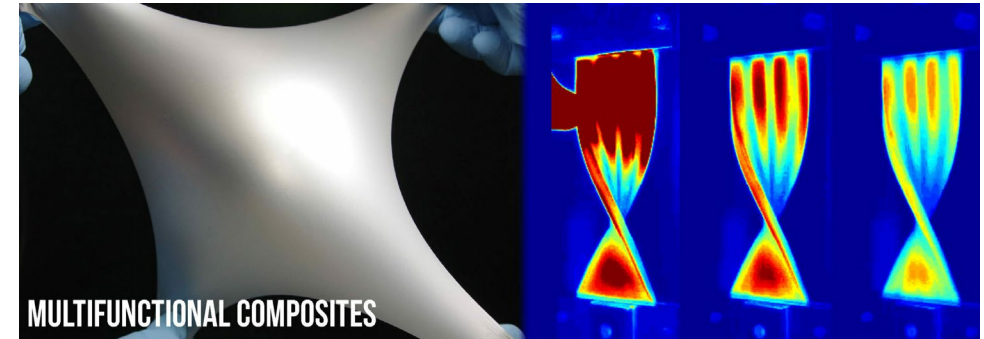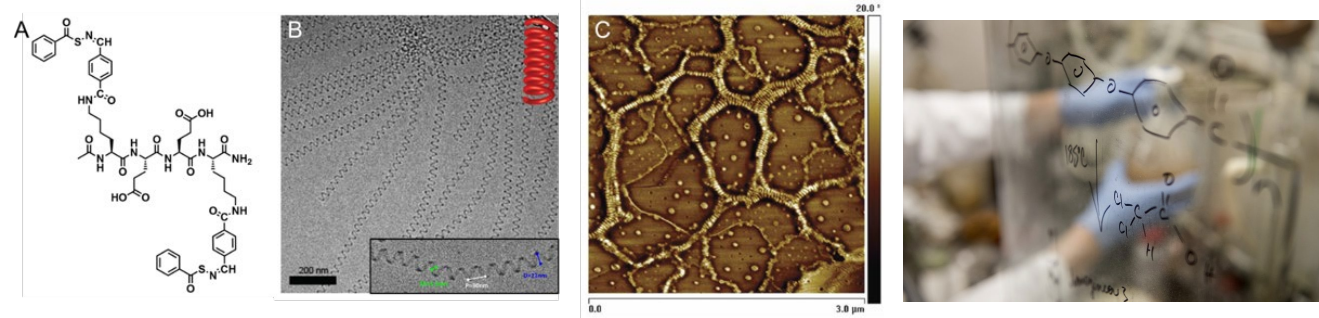
Mission. MII serves the research and education enterprise of Virginia Tech, with a focus on macromolecular materials and interfaces. MII is dedicated to advancing fundamental knowledge and technical innovations in macromolecular science and engineering through the synergistic pairing of interdisciplinary teams, impactful support of cutting-edge discoveries, valued partnerships with industry and national labs, and state-of-the-art education of our future leaders.

Vision. MII is committed to advancing the role of macromolecular materials in meeting the grand technological challenges of our global society. Through pioneering research and broad-based education, we will continue to strengthen our international reputation for excellence in macromolecular materials solutions to future challenges in health, sustainability, energy efficiency, national security, and advanced manufacturing.

Diversity. The Macromolecules Innovation Institute is committed to fostering diverse instructional, research, and outreach environments.

MACROMOLECULES INNOVATION INSTITUTE
VIRGINIA TECH.

MII Transdisciplinary Research Strengths

- Design and Synthesis of Novel Macromolecular Materials

- Macromolecular Materials for Energy Applications

- Adhesion and Interfacial Science

- Sustainable Materials and Processes

- Biopolymers and Bio-inspired Applications of Polymers

- Macromolecules in Advanced Manufacturing

- Nanostructured Materials and Composites

- Computational Design and Understanding of Macromolecular Systems and Processes

MII Affiliated Faculty

Aerospace & Ocean Eng.
Michael Philen
Gary Seidel
Gregory Young

Biological Systems Eng.
Justin Barone
Anna Duraj-Thatte
Drew Wang

Biomedical Eng. & Mechanics
Romesh C. Batra
Raffaella De Vita
David A. Dillard
Steve McKnight
Monet Roberts
Scott Verbridge

Chemical Engineering
Michael J. Bortner
Richey M. Davis
Sanket Deshmukh
William Ducker

Aaron S. Goldstein
Erdogan Kiran
Stephen M. Martin
Padma Rajagopalan
Rong Tong
Abby Whittington

Chemistry
Paul A. Deck
Alan R. Esker
Adrian Figg
Feng Lin
Guoliang (Greg) Liu
Louis A. Madsen
John B. Matson
Robert B. Moore
Amanda J. Morris
Michael Schulz
Diego Troya
S. Richard Turner
Valerie Welborn
Josh Worch

Civil & Environmental Engineering
Case, Scott W.

Computer Science
Layne Watson

Food Science & Technology
Haibo Huang
Joseph E. Marcy
Yifan Cheng

Geosciences
Marc Michel
Patricia Dove

ICTAS
Matthew Hull

Industrial & Systems Eng.
Blake Johnson

Materials Science & Eng.
Carolina Tallon
Hang Yu

Physics
Rana Ashkar
Shengfeng Cheng
James R. Heflin
Vinh Nguyen

School of Architecture + Design
Joe Wheeler

Mechanical Engineering
Michael Bartlett
Bahareh Behkam
Jonathan Boreyko
Jiangtao Cheng
Michael W. Ellis
Scott Huxtable
Zheng Li
Amrinder Nain
Ranga Pitchumani
Rui Qiao
Bart Raeymaekers

Danesh Tafti
Zhenhua Tian
Michael von Spakovsky
Christopher Williams

Sustainable Biomaterials
Kevin J. Edgar
Charles E. Frazier,
Young Tek Kim
Maren Roman
Jennifer Russell

VMRCVM – Biomedical Sciences & Pathology
Coy (Irving) Allen

> **73 Faculty** from 17 different departments and 6 different colleges

MII Affiliated Faculty

Aerospace & Ocean Eng.
Michael Philen
Gary Seidel
Gregory Young

Biological Systems Eng.
Justin Barone
Anna Duraj-Thatte
Drew Wang

Biomedical Eng. & Mechanics
Romesh C. Batra
Raffaella De Vita
David A. Dillard
Steve McKnight
Monet Roberts
Scott Verbridge

Chemical Engineering
Michael J. Bortner
Richey M. Davis
Sanket Deshmukh
William Ducker

Aaron S. Goldstein
Erdogan Kiran
Stephen M. Martin
Padma Rajagopalan
Rong Tong
Abby Whittington

Chemistry
Paul A. Deck
Alan R. Esker
Adrian Figg
Feng Lin
Guoliang (Greg) Liu
Louis A. Madsen
John B. Matson
Robert B. Moore
Amanda J. Morris
Michael Schulz
Diego Troya
S. Richard Turner
Valerie Welborn
Josh Worch

Civil & Environmental Engineering
Case, Scott W.

Computer Science
Layne Watson

Food Science & Technology
Haibo Huang
Joseph E. Marcy
Yifan Cheng

Geosciences
Marc Michel
Patricia Dove

ICTAS
Matthew Hull

Industrial & Systems Eng.
Blake Johnson

Materials Science & Eng.
Carolina Tallon
Hang Yu

Physics
Rana Ashkar
Shengfeng Cheng
James R. Heflin
Vinh Nguyen

School of Architecture + Design
Joe Wheeler

Mechanical Engineering
Michael Bartlett
Bahareh Behkam
Jonathan Boreyko
Jiangtao Cheng
Michael W. Ellis
Scott Huxtable
Zheng Li
Amrinder Nain
Ranga Pitchumani
Rui Qiao
Bart Raeymaekers

Danesh Tafti
Zhenhua Tian
Michael von Spakovsky
Christopher Williams

Sustainable Biomaterials
Kevin J. Edgar
Charles E. Frazier,
Young Tek Kim
Maren Roman
Jennifer Russell

VMRCVM – Biomedical Sciences & Pathology
Coy (Irving) Allen

73 Faculty from 17 different departments and 6 different colleges

Welcome to Our New MII-Affiliate Faculty from the College of Agriculture & Life Sciences

Zhiwu (Drew) Wang
Assist. Prof. BSE

Sustainable biotechnologies; waste water treatment and bioproducts recovery

Haibo Huang
Assoc. Prof. Food Sci & Tech

Sustainable food waste to value-added products

Yifan Cheng
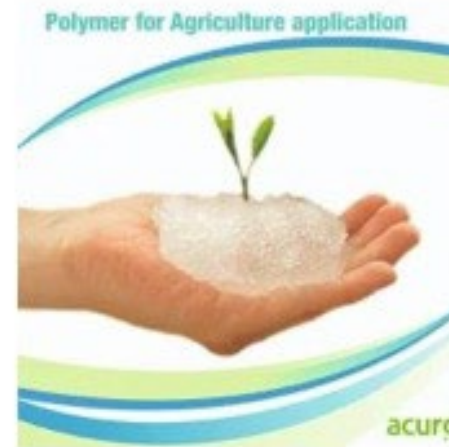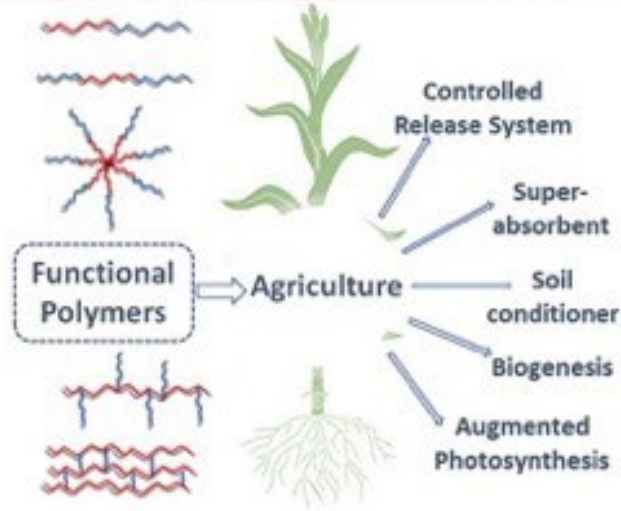Assist. Prof. Food Sci & Tech

Sustainable food packaging

Anna Duraj-Thatte
Assist. Prof. Bio Systems Eng.

Protein Engineering
Sustainable materials
Synthetic Biology

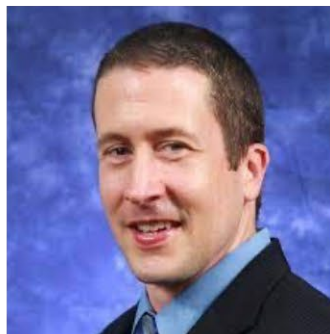# Macromolecular Innovations in Agriculture

Sustainable Innovations are the Future

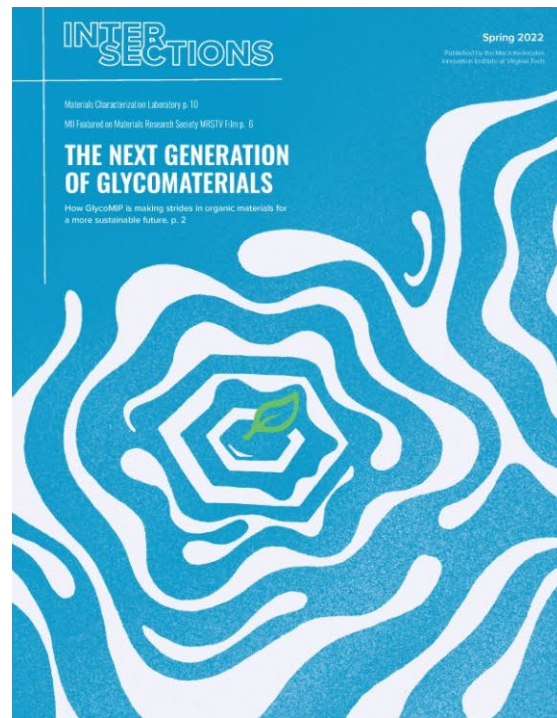2023 Covestro Lecture Series

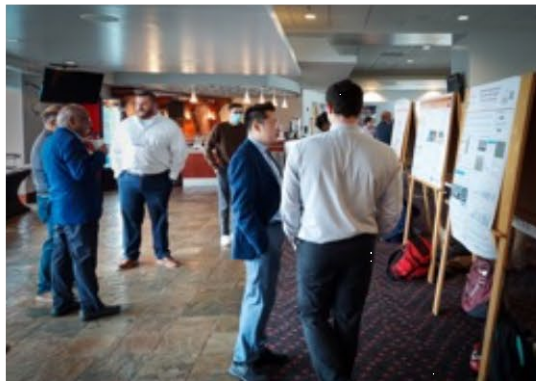Paul Honigfort

Director, Food Contact Substances

MII Intersections – Spring 2022

MII Intersections – Fall 2023

MII Polymer Sustainability Workshop Feb 2023

MII Impact on Elevating VT's Mission

- **Research and Scholarship** (Knowledge Creation and Discovery)
  - MII instills a Transdisciplinary Culture in research
  - MII builds synergy through interdisciplinary collaborations
  - Transdisciplinary research strengths stem from decades of leadership in advancing fundamental knowledge and technical innovations.
  - MII is an icon for Industrial Partnerships
    - Fundamental and applied discoveries leading to IP translations
    - Real-world solutions to commercial problems
    - Grand challenges requiring interdisciplinary input and teams
    - Workforce of the future
  - MII's new Seed Grants establish lasting collaborations
  - MII research and scholarly productivity has world-class impact and is increasing profoundly.

MACROMOLECULES
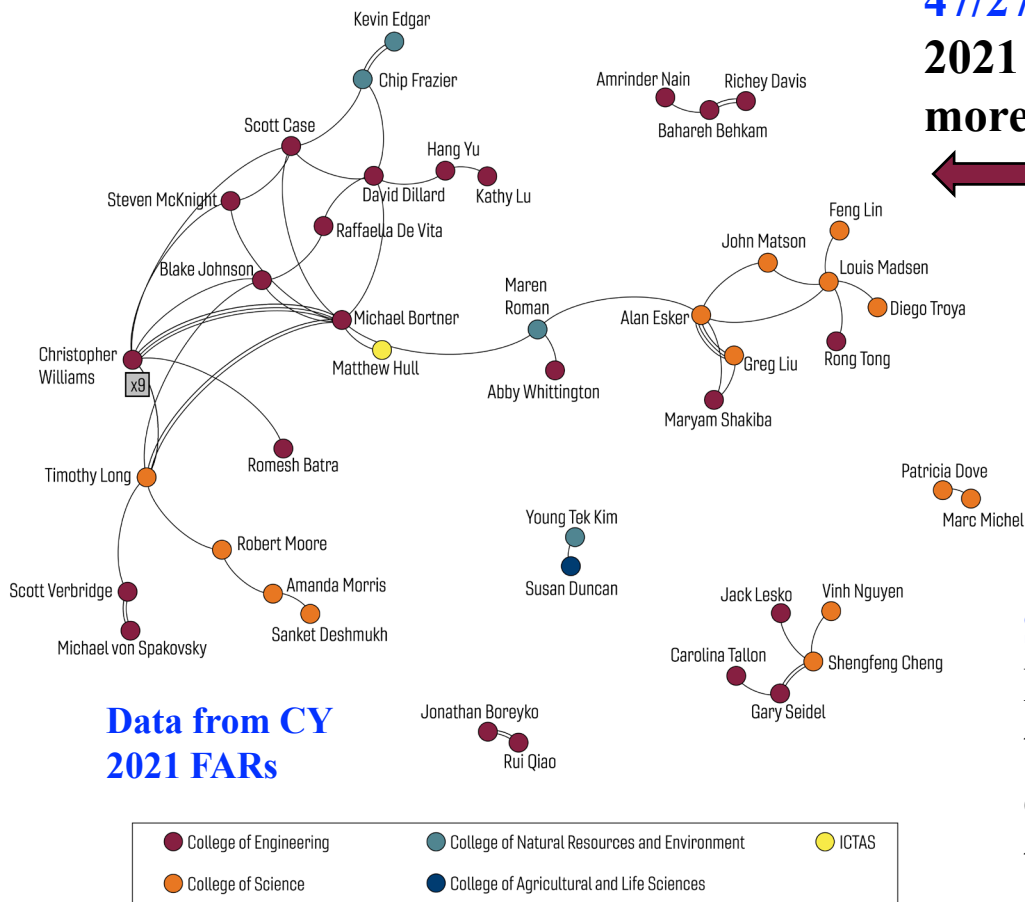INNOVATION INSTITUTE
VIRGINIA TECH.

Benefits of MII to Virginia Tech Researchers

- Affiliation with an internationally renowned research institute
- Access to state-of-the-art, shared research facilities (with valued input on new instrument acquisitions)
- Seed grant opportunities
- Teaming opportunities on large scale proposals
- Industrial and national lab partnerships
  - Frequent exposure to industrial sponsors
  - Teaming opportunities
- Solvay (Syensqo) Seminar Series
- Recruiting and access to high quality interdisciplinary MII and MACR students (MACR students come with 1st year funding from MII)
- Faculty and student awards (including student conference travel awards)
- Broad-reaching internal and external promotion of research accomplishments

MACROMOLECULES
INNOVATION INSTITUTE
VIRGINIA TECH.

MII Collaborations Build Synergy

MII Faculty Collaborative Publications in 2021

MII Faculty Collaborative Funded Projects in 2021

47/273 publications in 2021 were with two or more MII faculty.

Data from CY 2021 FARs

$5.3M in 2021 Research Expenditures (46.5% total) resulted from collaborations among two or more MII faculty.

Other CY21 Stats: **125** invited talks; **28** patents/invention disclosures; **130+** GRAs supported; **130+** MII undergrads
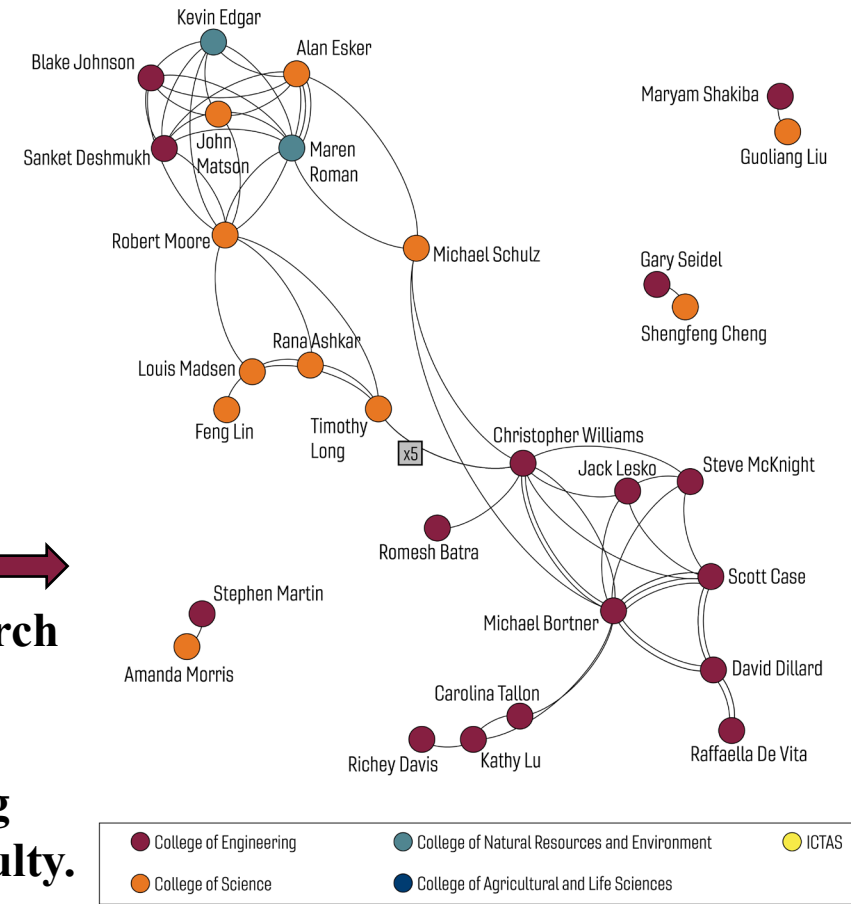
MII Outreach
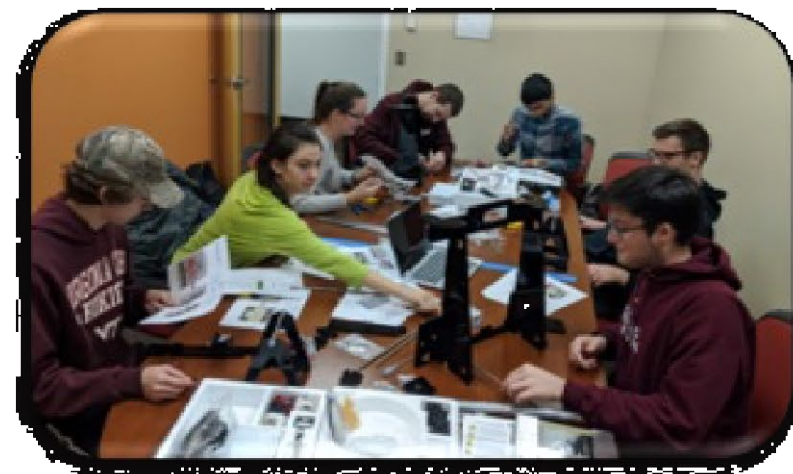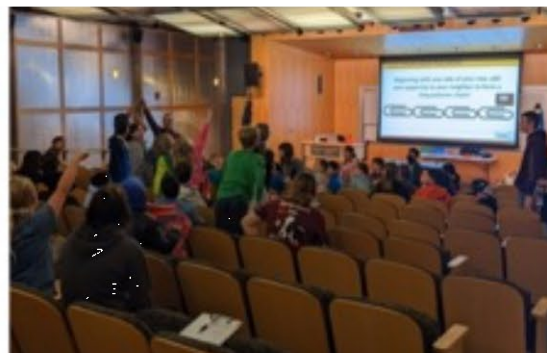
ACS Polymer Principles & Practice (August 2022)

Mike Bortner
VT Chem. Eng.

Bob Moore
VT Chemistry

John Matson
VT Chemistry

Tim Long
ASU Chemistry

5-Day Course with Lectures & Hands-on Labs
Offered 3 Times per Year at Virginia Tech

Lab Experiments are Led by Senior MII Graduate Students

MII – ICTAS Materials Characterization Lab (MCL)

"Cost-free access to all VT faculty, students and postdocs"

420 Kelly Hall

- Suite of TA thermal analysis instruments
  - TGA 5500 (new), 500; DSC Q2000, DMA Q800; TMA Q400; DHR 30 w/photocure (new)
- X-ray Analysis
  - Bruker XRD D8; Xenocs Xuess 3.0 USAXS/SAXS/WAXS (new)
- Spectroscopic Analysis
  - Solatron EIS; Hitachi U4100 UV/VIS/NIR; Varian 670 FTIR; XploRA Raman microscope, Bruker AFM
- Mechanical/surface testing
  - Instron 3340 UTS; Micro Materials Nanoprobe; Micromeritics 3 Flex BET; Oxford Juniper XR AFM
- Chromatography
  - Waters ACQUITY APC; Agilent PL-HT GPC
- Two Dedicated Technical Staff members for training and assistance (1 ICTAS and 1 MII)

Over $5.5M in state-of-the-art instrumentation, and we are always on the look-out for new instrument acquisitions – suggestions encouraged.

MACROMOLECULES INNOVATION INSTITUTE VIRGINIA TECH.

THANK YOU for the opportunity to introduce MII at the CAIA Big Event!
We look forward to enhancing MII's mission through
valued Synergy with CALS.

the INSTITUTE
FOR ADVANCED LEARNING AND RESEARCH
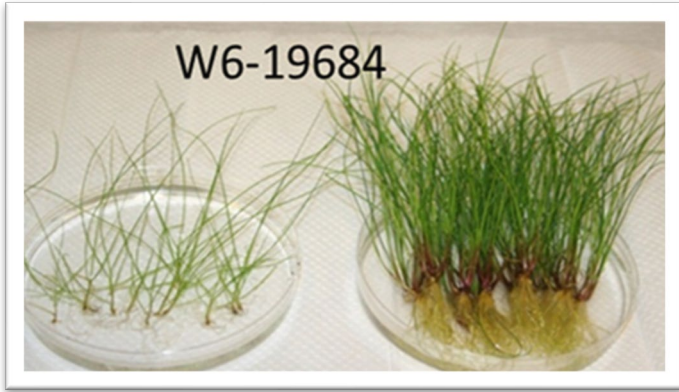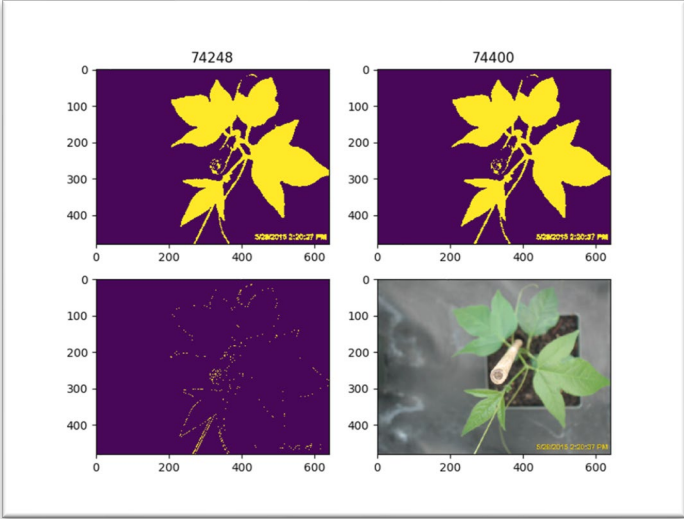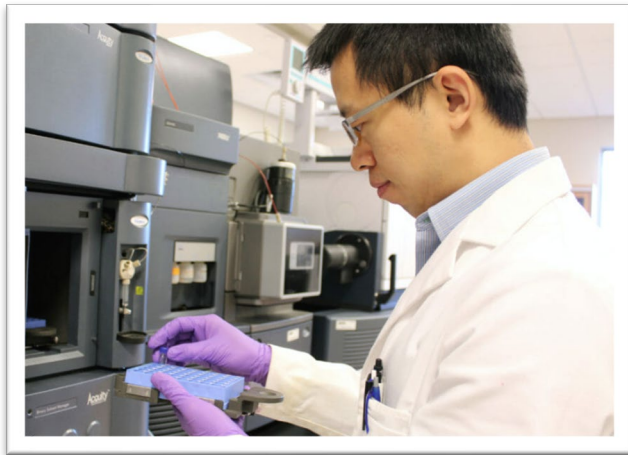
Biotechnology

Analytical Chemistry

Robotic Imaging

IALR Research Focus Areas

The VT IALR Controlled Environment Innovation Center

Supporting Industry Growth

- Contract Research
- Product Validation
- Equipment Rental
- Lab Space
- Workforce Training
- Grant co-development
- IP co-development

Create an Innovation Hub

- Research to Spinoffs to Jobs
- Tech Ecosystem

Dr. Michael Evans
Director SPES
Virginia Tech

Dr. Kaylee South
Assistant Professor
Virginia Tech

Workforce Development and Outreach

Internships

Excite Teacher Program and Field Trips

Mitchel Doss (VT)
Robotics and Coding

Emily Zhou (VT)
Postdoc Associate

Supporting Economic Development

AeroFarms®

Plenty®

BABYLON®
Harvest Anywhere.

the INSTITUT
FOR ADVANCED LEARNING AND RESEA

Driving Innovation in Partnership with Industry

Big Event 2024 Feedback

Faculty

<u>Parameters:</u>

- Feedback was collected through the breakout session written form and three surveys given during the breakout session.
- The breakout session and surveys centered around three questions.
    - Q1: What opportunities exist for cross-center collaboration?
    - Q2: What are important directions that CAIA can consider for thematic investment over the next year?
    - Q3: What opportunities for cross campus collaboration will be important for advancing these thematic areas?
- Non-synthesized feedback is stored in the breakout session folder.

<u>Q1 Synthesis:</u>

The faculty highlighted four main themes for cross-center collaboration opportunities: Collaboration and Integration, Multidisciplinary Approach and Networking, Impact and Application, and Development and Support. These highlight a need for **collaborative and interdisciplinary research initiatives**, emphasizing integration across centers, expertise, and resources. J**oint funding mechanisms, co-advising, and cross-center affiliations** are mentioned as ways to break down silos and foster collaboration. A focus **beyond academic research** to practical application and societal impact, with a goal of translating scientific findings into innovation and addressing community needs, was also highlighted. Multidisciplinary teams are suggested to be built naturally through **networking/social events**, and greater team support is highlighted as a need.

<u>Q2 Synthesis:</u>

Several themes were highlighted as areas of investment:

- **Community Engagement and Communication**: Emphasis on fostering connections between research and communities and facilitating interaction between farmers/stakeholders and technology.
- **Technological and Agricultural Innovation**: Focus on emerging technologies such as urban farming practices, digital agriculture, and smart irrigation techniques, alongside promoting the adoption of science and technology in agriculture to drive efficiency.

- **Workforce Development and Capacity Building**: Prioritization of workforce development initiatives and learning labs to enhance skills, knowledge, and capabilities.
- **Sustainability and Bioeconomy**: Commitment to promoting sustainable practices, including the adoption of bioeconomy and circular economy principles, as well as enhancing resilience in agroecological and food systems to address environmental and socio-economic challenges.
- **User-Centered Approach and Digitalization**: Adoption of user-centered design principles in digitalization efforts to ensure technology meets the needs and preferences of end-users, driving more effective and user-friendly solutions.
- **Cyberbiosecurity and Risk Management**: Recognition of the importance of cybersecurity in agricultural systems, with a focus on broadening cyberbiosecurity measures to mitigate risks and protect digital assets and operations.

Q3 synthesis:

The faculty highlighted 2 main themes for ways collaboration and thematic investment overlap: Collaboration and Partnership, Networking and Informal Interaction. Collaboration and Partnership efforts are underscored through connections with diverse Centers and stakeholders (CENI and IALR) for workforce development and research coordination, with a common example of **coordinating cross-center themes**. Networking and Informal Interaction plays a pivotal role in fostering communication, knowledge exchange, and community building. Suggested activities included **casual interactions** (wine and coffee), **field trips** (to Centers, labs, fields, etc.), and **meetings at unique and neutral locations** (museums). Finally, there was an emphasis on **connecting science and research to broader impacts** – facilitating the exchange and adoption of technology.

Survey responses:

Do you feel that working with different VT Centers enhances your faculty experience?

● Yes	13
● No	0
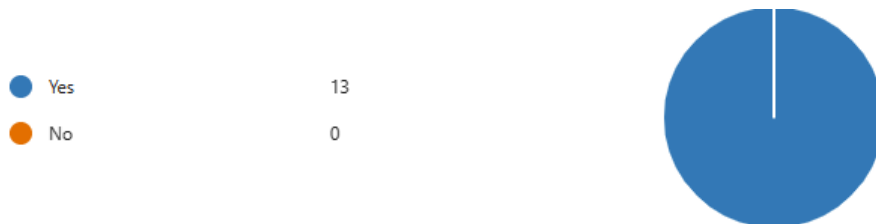
Why?

- "Learn what others are doing, see where my expertise can be used."
- "Diversity of expertise brings new ideas for tackling complex problems."

- "Many opportunities for interdisciplinary collaborations; seed funding opportunities."
- "Multidisciplinary nature."
- "It takes a village to tackle a research question."

Should VT Centers engage in more collaboration?

● Yes	13
● No	0

What topics, ideas, or events should cross-center collaborations focus on?

- "Annual meeting of the centers."
- "New faculty network building."
- "Extension activities."
- "Sharing resources."
- "Seed fund to form large teams, co-advise students, user inspired projects."
- "Get centers together to identify common targets and then host workshops."
- "Informal conversations."

Do you feel CAIA has successfully captured important research themes (past and present)?

|	
● Yes	11
● No	1

Why or why not?

- "I answer no because I am not sure. I cannot give a list of the captured research themes."

- "Needs a more objective way to find these ideas."
- "Captured the themes and brought groups together but still tons of room to grow."
- "These meetings are great for starting conversations but they have to continue beyond the meetings."
- "It will take a great amount of faculty and financial resources to do them well."

How can CAIA continue to improve its support for faculty through specific thematic investment?

- "Connecting JR/Pre-tenure/new faculty on and off campus; JR faculty mentoring program - it would be a good way to get to know jr faculty programs and how they can fit into other themed groups."
- "Seed funding to pursue larger collaborative opportunities."
- "Showcase affiliate faculty skills to foster connections."
- "I would instead urge for more fun networking events."
- "Schedule smaller follow-up meetings soon after CAIA sessions to keep ideas flowing."

Should CAIA play a larger role in fostering cross-campus collaborations?

| Yes | 8 |
| No | 0 |
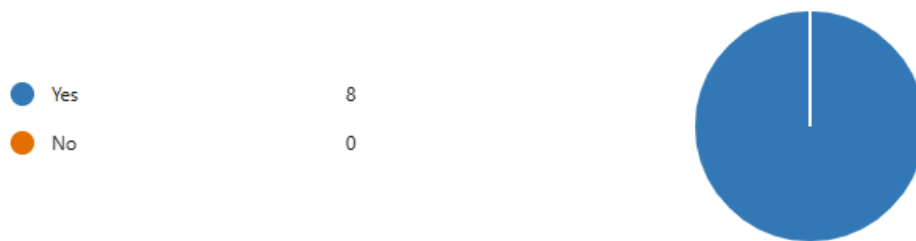
Why?

- "Multidisciplinary nature still lacks, CAIA can facilitate finding trustworthy potential partners."
- "Yes - but I would like to understand more about how VAES connects the ARECS and departments and where CAIA fits into that versus other types of campuses."
- "Maybe contribute but I don't think they are the leaders."
- "Diversity of disciplines represented - lots of opportunities, sometimes we just need some some direction/urging."
- "CAIA can play an important role in deliberately promoting and fostering collaboration."

What opportunities and themes exist between cross-campus collaborations and ways CAIA can support faculty collaboration?

- "Not known as of now" and "Not sure"
- "Faculty hosts for graduate students who will eventually move to another campus for research encouraging joint projects; extension, education, and outreach collaborations." and "Co-advising."
- "Sponsor casual social events centered around a common theme."
- "Seed grants."
- "Climate resilience; workforce development"
- "Enhance opportunities to discuss collaboration and synergistic research. Align collaboration priorities with sponsorship."

Graduate Students

Parameters:

- 26 students registered; 23 students attended
- 6 survey responses and anecdotal interviews by Will
- Quoted feedback and graphs below are taken directly from survey responses. Everything else is synthesized.

Synthesis:

Graduate students were very receptive and engaged during the professional development (PD) event. Positive feedback was received for both the **diversity of career experiences** in the panel and the **interactivity** of the science communication activity. While having the dinner first provided students more **flexibility in arriving on time** (most arrived within the last 30 minutes of the dinner), having dinner during the panelist could have provided more time, or a reception-like dinner could have been provided after the activities to allow students more in-person interaction with panelists.

Students expressed a need for **more professional development** and an interest in having more CAIA PD events in the future. **Diversity of career opportunities, how to build networks,** and **securing a job** (interview and negotiation practice) were future themes suggested by students. Many participants also conveyed satisfaction with the science communication activity and indicated **great interest in more science communication** practice.

Overall PD event rating:

- 4.33/5

Panel Feedback:

🔵	Very satisfied	3
🟠	Satisfied	2
🟢	Neutral	1
🔴	Dissatisfied	0
🟣	I did not attend the panel	0

- "It is nice to have a multidisciplinary group of panelists. My only concern is that some questions were not answered (the panelist say things, but not answering the question)."
- "I liked the diversity of careers, and I really appreciate more focus on careers in government, especially for people with biology background because it has only been just industry and academia so far."
- "The panelists were helpful because they have experience in different areas (industry, government, academia), and they share a lot of great suggestions."

Science Communication Activity Feedback:

🔵	Extremely useful	1
🟠	Useful	5
🟢	Neutral	0
🔴	Not useful	0
🟣	I did not attend the science com...	0

- "Overall experience was good. I liked the communication activity better; it was really helpful."
- The activity helped students think about how to change what they say for different audiences.
- The activity was engaging and pushed students to speak up.

ADP Catering Feedback:

🔵	Very satisfied	0
🟠	Satisfied	1
🟢	Neutral	3
🔴	Dissatisfied	1
🟣	I did not order food	1

- Three orders were incomplete.

- Water does come with the boxed lunches/dinners.
- The quality of the food was fine, and the delivery was very helpful.

Future PD Events Suggestions:

- "Communicating science, writing (white paper/ abstract/ impact statement, etc.), leadership/ team building activities."
- "Similar to this but maybe with a little more time."
- "How to improve networking, how to find internships and jobs, collaboration with industry people."
- "Interview and offer negotiation"
- "I think we need some communication activities to improve our communication skills which is very important to boost our network and connections."
- "Interactions with agriculture-related industry people."
- "Focused event on former international graduate students to get more insight and help with navigating little different career challenges international students might face."