Agricultural Technology Research Program

Doug Britton, Ph.D.
Program Manager

VISION

To transform Poultry, Agribusiness, and Food Manufacturing through Advanced Technologies
ATRP Strategic Research Thrusts

Growing the Partnership
Current Technologies in Poultry

• High-speed evisceration lines
• Machine vision grading system
• X-ray screening systems
• Automated Deboning
• Waterjet cutting
• Data driven processes (SPC)
• In process water recycling
• Continuous food safety monitoring
Where are we headed?

Technology & Automation Challenges

- Natural variability of the product
- Complexity of encoding manual tasks
- Efficiency of human operators
- Necessary production flexibility
- Other factors …

Lot sizes of 1

- No longer process to the averages
- Intelligent systems - adapt to each product individually
- Fully integrated data across production & processing
- Goal: Increased throughput & efficiency
Enabling Technologies …

- **Artificial Intelligence (AI)**
  - Google TensorFlow – ML library
  - Amazon Machine Learning – supports AWS

- **High performance computing clusters**

- **Ubiquitous sensing platforms & data**
  - Smart phones, 3D sensors, multi-spectral, etc.
  - Perception & scene understanding

- **Collaborative & lower cost robotics**
  - Universal Robotics, etc.
  - Autonomy
My interests in AgTech

Harald Scherm, Professor & Head, Department of Plant Pathology, University of Georgia; scherm@uga.edu

• Career-long interest in using data and models to understand and predict plant disease development and spread

• Co-developer and current Coordinator of interdisciplinary graduate certificate in Agricultural Data Science at UGA (since 2019)

• Co-chair of cluster hire in Integrative Precision Agriculture at UGA (5 new faculty positions between 2021 and 2023)

• For nearly 10 years, collaborated with Georgia Tech on AgTech research proposals and developing a roadmap for AgTech in Georgia
Interdisciplinary Graduate Certificate in Agricultural Data Science

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<th>Goals of the Program</th>
<th>Structure of the Program</th>
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<td>• Using a structured curriculum, provide students with specialized training in agricultural data science</td>
<td>• Open to enrolled UGA graduate students in agricultural sciences and allied disciplines</td>
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<td>• Produces graduates who bridge the gap between the generation, analysis, and interpretation of complex data in the agri-food sector</td>
<td>• Requires 16 credits from two core courses, one seminar course, and a range of electives providing flexibility for students from various majors</td>
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<td>• Builds on UGA’s strength in the agricultural sciences and its campus-wide informatics initiative</td>
<td>• For more information: <a href="https://site.caes.uga.edu/agdatascience/">https://site.caes.uga.edu/agdatascience/</a></td>
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Where I see opportunities for AgTech in Georgia

Georgia as the hub of the “next green revolution” driven by sensors, data, models, and automation

Goals:

• **Farmer**: improve production efficiency & reduce losses through better decision-making

• **University**: high-impact research area at interface between agricultural sciences, engineering, and informatics

• **State**: economic and workforce development; public-private partnerships
Where I see opportunities for AgTech in Georgia

• Agriculture continues to be the top sector of the economy ($70.1 billion economic contribution)

• Diverse and unique crop portfolio - including major row crops and specialty crops - requires unique technologies, different from what others are doing

• High labor demand of specialty crops provides impetus for automation and robotics

• Georgia’s position as a major transportation hub – air- and seaports

• World-class agricultural sciences and engineering programs at UGA, GT, FVSU
Examples of AgTechnologies that get me excited

- **Multimodal sensing, sensor fusion** – combining data from imaging, volatiles, plant/soil-embedded sensors

- **More robust predictive models through AI**, e.g. machine-learning for improved image classification, dealing with small samples and data shifts

- **Precision pest management (PPM)**
  - Warm and humid climate, long growing season, and sandy soils increase pest pressures, which makes PPM attractive in the Southeast
  - Technologically challenging because pests are difficult to distinguish and highly mobile – combination of advanced imaging and modeling

- **Belowground crop imaging** - both scientifically challenging and practically relevant (e.g., peanut yield estimation, root disease detection)
Sound of Silence: Deciphering What Our Leafy Friends are Trying to Tell Us

May 20, 2021

Jie Xu
Intelligent Sustainable Technology Division
Georgia Tech Research Institute
Volatile Organic Compounds Emitted from Plants

• Plant volatiles comprise thousands of low-molecular weight, hydrophobic molecules.

• They are classified as ‘secondary’ (specialized) metabolites, but are closely related to ‘primary’ (general) metabolites.

• Plants emit VOCs from leaves, flowers, fruits, roots and stems

• An average plant produces over 100,000 chemicals, of which 1700 are known to be volatile.
~1700 Plant VOCs

- Acetate Pathway
- MVA Pathway
- MEP Pathway
- Shikimate Pathway

- Fatty acid derivatives (GLVs)
- Sesquiterpenoides
- Terpenes
- Benzenoides, phenolics
Who’s Listening to Talking Plants?

• To leverage the plant VOC based communication signals in applications......

Information Extraction from Plant VOCs
Enabling Technologies

Robotic arms for tissue collection & sensing

VOC sensors for field diagnostic

Interferometric sensor

Detector

Laser

Air sample intake tubing

MZI sensor
AGCO AND AG-TECH

RAVI GODBOLE

MAY 20, 2021
A Global Ag OEM with HQ Based in Duluth, GA
20000+ employees with 2020 Revenue 9.1B

Fuse encompasses all core brands
OUR CHALLENGE: SUSTAINABLE PRODUCTIVITY GROWTH

SUSTAINABILITY
ENVIRONMENTAL, SOCIAL, FINANCIAL ASPECTS OF CROP PRODUCTION AND LIFESTOCK MANAGEMENT

PRODUCTIVITY
DELIVER FOOD, FEED, FUEL, FIBER FOR A GROWING POPULATION
FARMER FIRST – AT THE HEART OF EVERYTHING WE DO

Exceptional Customer Experiences
Creating a consistently exceptional experience for our farmers

High Quality, Smart Solutions
Maximize farmers’ outcomes with innovative, full-line offering of digitally-enabled solutions

Customer-Connected Distribution
Serve farmers in the way they choose along the entire life cycle

PASSION FOR OUR FARMERS IS AT THE HEART OF EVERYTHING WE DO
FULL LINE SMART FARMING PORTFOLIO

**Strategic Focus**

- **Connectivity**: Enabling remote accessibility, visibility, and management via the Cloud
- **Autonomy/Automation**: Building out autonomous capability
- **Robotics**: Developing machine vision & spray drift management technology
- **Electrification**: Converting from mechanical to electrical power
- **Edge Computing**: Harness agronomic potential on equipment in real-time

**Today’s Smart Machines**

- **IDEAL Combine**
- **Momentum Planter**
- **Fendt 700 Series**

**Tomorrow’s Smart Machines**

- **XAVER**: Autonomous Concept
OUR NEWEST GRAIN AND PROTEIN DIVISION MAKES US A FARM TO FORK AG-TECH SOLUTIONS PLAYER
GrainViz lets customers see moisture content of the entire grain mass
Sensor technology that measures conditions at the animal level.
Remote monitoring that provides insights on equipment performance.
CREATING VALUE FOR FARMERS BY DELIVERING IMPROVED OUTCOMES INCLUDING GEORGIA FARMERS!

Crop Cycle Opportunities

AGCO’s Goal is to Enable:

20%

Improvement in net farm income

Productivity – Reliability – Ease of Use - Innovation
Thank You.

Questions are Welcome.

RAVI.GODBOLE@AGCOCORP.COM