



**RIT**  
College of Science  
Chester F. Carlson Center  
for Imaging  
Science

# STRATUS 2026 Conference

Systems and Technologies for Remote Sensing Applications  
Through Unmanned Aerial Systems

May 18-19, 2026, RIT Inn and Conference Center,  
Rochester, New York, USA





## STRATUS 2026 Conference

Systems and Technologies for Remote Sensing Applications  
Through Unmanned Aerial Systems

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# Welcome from the General Chair



On behalf of the organizing committee, it is my pleasure to welcome you to the 8th conference on Systems and Technologies for Remote Sensing Applications Through Unmanned Aerial Systems, or simply, STRATUS 2026.

What began in 2016 as a one-day IEEE GRSS-supported workshop has grown into a recognized venue for researchers, practitioners, and students working at the intersection of remote sensing and unmanned aerial systems.

Over the past decade, STRATUS has evolved alongside the field itself, expanding in scope, maturity, and impact, while maintaining its original mission: to foster meaningful interactions between academia, industry, and government.

This year has presented unique challenges for the broader research and funding landscape, which has been reflected in reduced sponsorship and fewer abstract submissions. As a result, STRATUS 2026 has been structured as a two-day program featuring 22 technical presentations and a more focused group of attendees. While more intimate than prior years, this format offers a valuable opportunity for deeper engagement, stronger discussions, and more meaningful networking among participants.

The technical program continues to highlight important advances across sensing modalities, platforms, data exploitation, and emerging applications. I am grateful to all authors, presenters, and reviewers who contributed their time and effort to ensure the quality of this year's program. I would also like to extend my sincere thanks to my co-chair, Dr. Bahram Salehi, who has been instrumental in organizing this conference alongside me since 2019. His continued partnership, dedication, and support have been critical to the success and continuity of STRATUS over the years.

I would also like to sincerely thank our sponsors: Arcadis, the University of Rochester Center for Emerging and Innovative Sciences, NUAIR, and Cubert, Inc., for their financial support of the conference. In addition, CRC Press is generously providing two \$150 gift certificates to recognize the best student presentations. Their support plays a critical role in enabling this conference and in recognizing excellence within our student community.

Despite the challenges, the core spirit of STRATUS remains unchanged. This conference exists because of the community that supports it. Your participation, collaboration, and willingness to share ideas are what make it successful.

I encourage you to take full advantage of the discussions, presentations, and informal interactions throughout the event. Thank you for being part of STRATUS 2026, and I hope you find the conference both engaging and rewarding.

Emmett J. Ientilucci

2026 STRATUS Conference Chair

## Welcome from Co-Chair



Welcome to STRATUS 2026 at the Rochester Institute of Technology (RIT), where the conference series first began in 2016. Over the years, STRATUS has grown into an important forum for advancing UAV remote sensing across environmental monitoring, agriculture, forestry, infrastructure, and many other applications.

Held in the beautiful spring season of Upstate New York, STRATUS 2026 brings together researchers, government agencies, and industry professionals to share the latest developments in UAV technologies, data processing, and applications. This year's program includes six technical sessions, including 22 presentations and a keynote highlighting UAV initiatives and funding opportunities at the USDA.

We gratefully acknowledge the support of our sponsors, including NUAIR, ARCADIS, ZaminSense Inc., the University of Rochester Center for Emerging & Innovative Sciences, Cubert, and CRC Press, whose contributions help make this event possible.

I wish you a productive and enjoyable conference experience and look forward to the collaborations and discussions that STRATUS 2026 will inspire.

Warm regards,

Bahram Salehi, Ph.D., P.Eng  
STRATUS 2026 Co-Chair

Associate Professor of Remote Sensing Engineering  
SUNY College of Environmental Science and Forestry  
Co-Founding CEO at ZaminSense Inc.

# Program Committee

## General Chair



Emmett Lentilucci  
Chester F. Carlson Center for Imaging  
Science, Rochester Institute of  
Technology

## Co-chair Technical Program Chair



Bahram Salehi  
SUNY College of Environmental  
Science and Forestry

## Web Administrator



Sina Jarahizadeh  
SUNY College of Environmental  
Science and Forestry, Syracuse, NY

## Communications Chair



Karen Braun  
Rochester Institute of Technology

## Sponsorship Chair



Timothy Bauch  
Research Engineer, Rochester  
Institute of Technology

## Sponsorship Assistant



Jan Wasilewski  
Rochester Institute of Technology

### **Finance Chair**



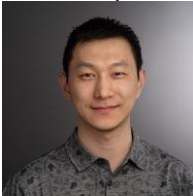
Robert Kremens  
Rochester Institute of Technology

### **Local Arrangements Chair**



Amir Hassanzadeh  
Rochester Institute of Technology

### **Tutorials/Workshop Chair**



Fei Zhang  
Rochester Institute of Technology

### **Student Involvement Chair**



Jason Salmanowitz  
Rochester Institute of Technology

# Map to Social Gathering on Monday Evening

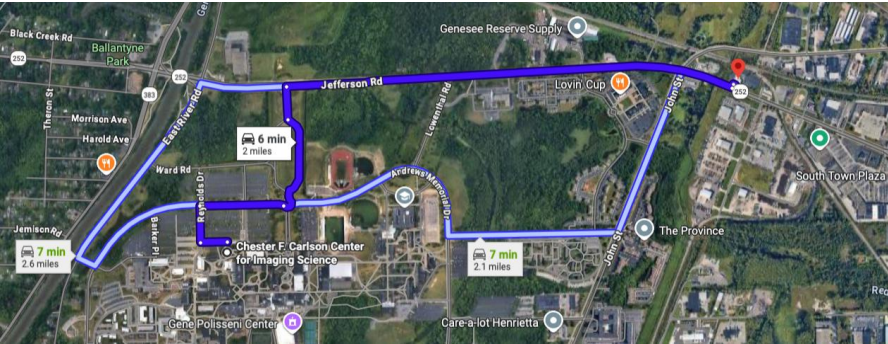
Monday, May 18

6:00 - 8:00 PM

Shamrock Inn

300 Jefferson Rd, Rochester, NY 14623

6-minute car ride; 36 min walk from the venue



## WiFi Instructions

1. Connect to **RIT-Guest** Wi-Fi network.
2. Once connected, a browser window will automatically open on your device. If it does not, simply open an internet browser to trigger the login page.
3. The login page will prompt you to enter a 10-digit phone number. A PIN will then be texted to that number, which you can enter in the same browser window to complete the connection process.
4. Once entered, you should be connected.
5. If you have any trouble logging on during the conference, please feel free to ask a banquet team members on-site for additional assistance.

## Sponsors

We would like to thank our sponsors for their generous financial support!



## STRATUS 2026 Conference

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## ULTRIS X20 Plus - Gimba

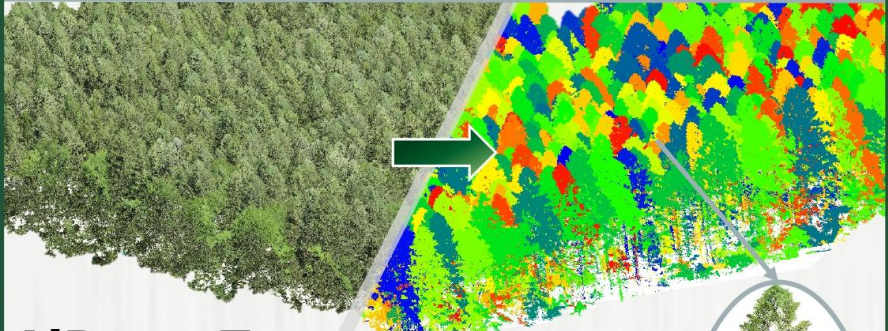
### ULTRIS gimbal for DJI M300 RTK

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*An AI Platform for Automatic Drone Data Processing to Segment Individual Trees and Measure Their Attributes in Forests and Urban Environments.*



### **Applications**

- *Utility and Power Management*
- *Drone and Forestry Software*
- *Urban and Forest Tree Inventories*
- *Forest Fire Prevention and Combat*
- *Timber Production Management*
- *Urban Heat Island*

X = 412046.1  
Y = 4734818  
Z = 596.2  
Height = 33 m  
Surface Area = 758 m<sup>2</sup>  
Volume = 1214 m<sup>3</sup>  
Crown Diameter = 7.5 m  
AGB = 1280.3 KG  
Carbon Storage = 640.2 KG

**ZaminSense.com**





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## Redefining what's possible

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## CRC Press

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# CEIS

**Research + Industry = Transforming Technology**

In 2025, CEIS, the Center for Emerging and Innovative Sciences, a New York State Center for Advanced Technology at the University of Rochester, was awarded a 10-year extension of its contract with NYSTAR, the Empire State Development Division of Science, Technology, and Innovation. The center's primary goal is to promote economic development in New York State through industry-university collaboration and technology transfer. CEIS works with companies across the state. Its technical focus areas include optics, photonics, imaging, electronics, sensors, and health technologies. CEIS supports industry-university collaborative projects at both the University of Rochester and the Rochester Institute of Technology.

## CEIS supported economic development activities:

- The annual Finger Lakes Science and Technology Showcase that connects university researchers with industry professionals and the public.
- A new "Intelligent Imaging" initiative co-sponsored with the Center of Excellence in Data Science and AI to support the development of AI-enabled imaging across multiple applications and imaging modalities. ([more](#))
- Periodic community topical round-table discussions to bring together researchers and companies to identify new collaborative opportunities.

## Funding opportunities

### COLLABORATIVE INNOVATION RESEARCH (CIR)

- Proposals are submitted by University researchers
- Up to \$40,000 WITH 2:1 match requirement (company:CEIS)
- Projects run for one year and may be renewed
- Funds are used to support on-campus research projects
- Submissions are accepted on a rolling basis ([more](#))

### SHORT TERM APPLIED RESEARCH (STAR)

- University researchers may apply for up to \$10,000 with flexible corporate matching requirement
- Address the needs of businesses in technical and business development areas
- Solve critical short-term problems
- Focus on NY State small businesses
- Submission accepted on a rolling basis

#### HOW TO APPLY:

Funding applications are available via the QR code or FUNDING menu on the CEIS website. For further information please contact CEIS by email [ceisweb@ur.rochester.edu](mailto:ceisweb@ur.rochester.edu) or phone (585) 275-2104.



[www.ceis.rochester.edu](http://www.ceis.rochester.edu)



University  
of Rochester  
Center for Emerging &  
Innovative Sciences



Division of  
Science, Technology  
& Innovation

## Keynote Speaker, Monday, May 18



### **Funding for Unmanned Systems Research and Related Technologies in Agriculture at the USDA-NIFA**

***Steven J. Thomson, Ph.D.***

Dr. Steven J. Thomson is a National Program Leader (NPL) with the USDA National Institute of Food and Agriculture (NIFA) and Fellow with the American Society of Agricultural and Biological Engineers (ASABE). His career began as a Research Engineer with the University of Georgia, then moved on for a Ph.D. at the University of Florida, where he developed a cyber-physical system that synergized soil-water sensing and soil-water balance modeling in a machine learning scheme to more accurately characterize crop water use for irrigation management. Dr. Thomson has a background in sensing and electronic systems, precision crop and water management, remote sensing, applied statistics, and spray drift management for aerial application of crop protection materials. Dr. Thomson received both the Alpha Epsilon Award for his Research/Extension program and Outstanding Faculty Award in the Biological Systems Engineering (BSE) Dept. while on faculty at Virginia Tech. He was a Lead Scientist with the USDA ARS before joining USDA-NIFA as a National Program Leader in 2016. He has authored or co-authored over 100 journal articles, two book chapters, and several Extension publications and software.

# Program Agenda at a Glance

	Day 1: Monday May 18	Day 2: Tuesday May 19
8:00 -8:30	<b>Registration &amp; Breakfast</b>	<b>Registration &amp; Breakfast</b>
8:30 -9:00	<b>Welcome, Opening Remarks</b> Dr. Emmett Ientilucci, RIT & Dr. Bahram Salehi, SUNY-ESF, Conference Co-Chairs Dr. Andre Hudson, Dean, RIT College of Science	<b>Welcome, Opening Remarks</b> Dr. Emmett Ientilucci, RIT & Dr. Bahram Salehi, SUNY-ESF, Conference Co-Chairs Dr. Jan van Aardt, RIT CIS Director Joseph Sirianni, Associate Director, RIT Remote Sensing Group
9:00 -9:30	<b>Keynote</b> Programs and prospects for UAS utility in Agriculture. <i>Dr. Steven Thomson National Program Leader, USDA National Institute Food and Agriculture (NIFA)</i>	<b>Special Session</b> UAV-Related Research and Teaching at RIT Imaging Science and SUNY ESF <i>Dr. Emmett Ientilucci and Dr. Bahram Salehi</i>
9:30 -10:50	<b>Session M1: ROCX Data Collection and Outcomes</b> <b>M11:</b> An Overview of ROCX 2025, <i>John Kerekes and Nina Raqueno, RIT</i> <b>M12:</b> Orientation-Dependent Sub-Pixel Target Detection by Performance in Hyperspectral Imagery, <i>Muskan Kingrani and John Kerekes</i> <b>M13:</b> ROCX UXO Experiment: Large-Scale Multi-Platform Hyperspectral Dataset of PFM-1 Anti-Personnel Landmines, <i>Charles Hamesse, Hannes De Meulemeester &amp; Rob Haelterman</i> <b>M14:</b> ROCX 2025: A Multi-Sensor UAV and Ground-Based Experiment for Surface PFM-1 Landmine Detection, <i>Sagar Lekhak, and Emmett Ientilucci</i>	<b>Session T1: UAV for Construction &amp; Building</b> <b>T11:</b> Comparative Evaluation of Uncrewed Aerial Systems (UAS)-Based Bridge Inspection Results Against Routine Engineering Inspection, <i>Samin Mirzaghanbarpour, Saeed Jafari Kang, and Reihaneh Samsami</i> <b>T12:</b> Integrating Uncrewed Aerial Systems (UAS)-Based 3D Photogrammetric Modeling and Deep Learning for Bridge Deck Crack Detection: An MDOT Case Study, <i>Samin Mirzaghanbarpour, Sharmin Jahan Badhan, and Reihaneh Samsami</i> <b>T13:</b> Combining UAS Photogrammetry and Terrestrial Laser Scans to Create a Full 3D Building Model, <i>William Stiteler, Adam Guadagnoli, Nikki Karpf, and Donald Reed</i> <b>T14:</b> UAS-Delivered versus Human-Placed Training Aids for Detection K9s, <i>Katherine Baronowski and Eric Best</i>
10:50 -11:20	<b>Coffee Break</b>	<b>Coffee Break</b>
11:20 -12:20	<b>Session M2: UAV for Risk Assessment and Management</b> <b>M21:</b> Evaluation of UAS for Landmine and Unexploded Ordnance Detection, <i>Alaura Kanell and Jamey Jacob</i> <b>M22:</b> A compact drone payload to monitor gaseous emission products, <i>Robert Kremens, Emmett Ientilucci, and Martin Held</i> <b>M23:</b> UAV-Based 3D Reconstruction and Modeling of Blast-Induced Muck pile Formation, <i>Fei Zhang, Michael Gartley, and Emmett Ientilucci</i>	<b>Session T2: UAV Hardware and Sensor</b> <b>T21:</b> Small UAS-Deployable Ultra-Light Time-Domain Electromagnetic Induction Sensor, <i>Max Orman Kollmar, David Lozano, Michele Maxson, Brian Quinn, and Fridon Shubitidze</i> <b>T22:</b> A Community Powered, Multi Sensor System for Early Wildfire Detection and Coordinated Response, <i>Daniel Rice, Ekaterina Gnedenko, and Roman Rice.</i> <b>T23:</b> Model-Based Hardware-in-the-Loop [HIL] Simulation Architecture for Vision-Based UAV Navigation, <i>Daniel Kaputa, and Atharva Patil</i>

12:20 -1:00	Lunch / Group Photo / Networking	Lunch / Group Photo / Networking
1:00 -1:30	Workshop - The Rochester Intelligent Imaging Initiative (RI <sup>3</sup> )	
1:30 -2:50	<p><b>Session M3: UAV for Vegetation and Forestry</b></p> <p><b>M31:</b> AiDroneTree: A Software for Automatic Individual Tree Detection, Inventory, and Biomass Estimation Using UAV Point Cloud, <i>Sina Jarahizadeh and Bahram Salehi</i></p> <p><b>M32:</b> Enhancing Individual Tree Biomass Estimation in Dense Forest and Urban Environments Using UAV LiDAR Through Training Data Augmentation, <i>Sina Jarahizadeh and Bahram Salehi</i></p> <p><b>M33:</b> Subcanopy object detection, <i>Jan Wasilewski, Jan van Aardt, and Bartosz Krawczyk</i></p> <p><b>M34:</b> Surface2Terrain: A Web-Based Tool for Generating Digital Terrain and Canopy Height Models from Drone Imagery, <i>Robert Chancia</i></p>	<p><b>UAV Trivia Game-2, Awards, and Closing Remarks</b></p> <p>Conference Co- Chairs: Dr. Bahram Salehi, SUNY-ESF Dr. Emmett Lentilucci, RIT</p> <p><b>Student Presentations and UAV Trivia Winners</b></p>
2:50 -3:10	Coffee Break	
3:10 -4:30	<p><b>Session M4: UAV Data Processing</b></p> <p><b>M41:</b> Low Cost Tools and Techniques for Characterization of Hyperspectral Imaging Sensors, <i>Tom Chrien, Chris Chovit, Jacob Kuhlman, Evan Gould, Zachary Chrien &amp; Seth Curtin</i></p> <p><b>M42:</b> Establishing Baseline Forest Biomass and Carbon Stock Using UAV LiDAR: Evidence from Ainu Bhatti Forest, Punjab, <i>Muhammad Muzamil Khan, Shahid Imran and Rabia Munsaf Khan</i></p> <p><b>M43:</b> A Quarriable Earth: Semantic Search and Change Detection in Aerial Imagery using Vector Embeddings, <i>Matthew Hanson</i></p> <p><b>M44:</b> Unsupervised Characterization of Vertical Atmospheric Structures for Adaptive UAS Sampling, <i>Alejandro Medina, Hernan Moreno, Luis A De la Fuente, Elizabeth Smith, and Miguel Velez-Reyes</i></p>	
4:30 -5:00	UAV Trivia Game-1	
6:00 -8:00	<p><b>Happy Hour</b></p> <p>The Shamrock Inn, 300 Jefferson Rd, Rochester, NY</p>	

# Abstracts

## Session M1: ROCX Data Collection and Outcomes

Title	An Overview of ROCX 2025			
Author keywords	ROCX 2025 Hyperspectral Imaging UAS Imaging			
Abstract	<p>There is a continual need for well ground-truthed remote sensing data collections. As new modalities, platforms, and sensors are deployed, it is important to develop data sets with ground-truth for research and education purposes. In the spring of 2024, RIT began planning for a major data collection activity coined the RIT Open Community eXperiment (ROCX), to be held in September 2025. A solicitation of interest from the community resulted in over 100 individuals joining the ROCX Working Group. From June 2024 through September 2025, 28 online Working Group meetings were held, with participants sharing ideas and plans for the collection. Two open periods were held in late 2024 and early 2025 to solicit proposals for data collections and ground experiments. ROCX coordinators agreed to host the event and reserved RIT's Tait Preserve in nearby Penfield for the planned two-week period. The coordinators developed written Participant Agreements to be signed by all parties, clarifying roles and responsibilities. Detailed logistical plans were also developed. During the September 4–18, 2025 experiment period, 75 participants from 24 organizations and 6 countries came to the Tait Preserve to set up ground experiments and collect data. Data were acquired by more than a dozen ground instruments, eight UAV platforms, two airplanes, and at least six satellite platforms. Efforts are now underway at Rochester Institute of Technology to collect and curate the data for distribution on an open-access website for use by the global remote sensing community.</p>			
<b>Authors</b>				
first name	last name	email	country	affiliation
John	Kerekes	jpgkpci@rit.edu	United States	Rochester Institute of Technology
Nina	Raqueno	ngRPCI@rit.edu	United States	Rochester Institute of Technology

Title	Orientation-Dependent Sub-Pixel Target Detection Performance in Hyperspectral Imagery
Author keywords	Hyperspectral target detection ROCX 2025
Abstract	<p>Hyperspectral imaging (HSI) enables the detection of spatially unresolved (sub-pixel) targets by leveraging high-dimensional spectral information. While sub-pixel detection algorithms are widely studied, the effects of target fill fraction and geometric orientation on detection performance are not yet fully quantified. This work examines the influence of target orientation and fractional area coverage on sub-pixel detection performance using controlled hyperspectral measurements over natural backgrounds. Lattice-based targets with known fill fractions were deployed on grass and gravel surfaces in both horizontal and tilted configurations to simulate unresolved targets under varying geometric conditions. Targets with spectrally distinct surface coatings were imaged using a radiometrically calibrated pushbroom hyperspectral sensor covering the visible to shortwave infrared spectral range mounted on a UAS. Detection performance was evaluated using the Adaptive Cosine Estimator (ACE), with results assessed through receiver operating characteristic (ROC) analysis plotted on a logarithmic false-alarm axis. Results indicate near-perfect detection performance in both orientations for fill fractions greater than approximately 40%, with area-under-the-curve (AUC) values approaching unity. At lower fill fractions, measurable performance differences are observed as a function of target orientation, with tilted configurations exhibiting modest improvements in detectability in select cases. These findings demonstrate that target geometry can influence sub-pixel detection outcomes and should be considered when designing experiments and interpreting algorithm performance.</p>

<b>Authors</b>				
first name	last name	email	country	affiliation
Muskan	Kingrani	mk2497@rit.edu	United States	Rochester Institute of Technology
John	Kerekes	jpkpci@rit.edu	United States	Rochester Institute of Technology

Title	ROCX UXO Experiment: Large-Scale Multi-Platform Hyperspectral Dataset of PFM-1 Anti-Personnel Landmines			
Author keywords	Anti-personnel Landmine Detection Dataset Multispectral Hyperspectral Sensor fusion			
Abstract	<p>Accurate detection and mapping of surface-laid anti-personnel mines remain a critical challenge for humanitarian demining and defense operations, particularly in environments where Global Navigation Satellite System (GNSS) signals are unavailable or unreliable. In such settings, imaging-based mine detection requires sensing modalities that can simultaneously provide reliable material discrimination and precise spatial localization in order to both detect and localize mines. Hyperspectral imaging is state-of-the-art for imaging-based material discrimination; however, its high cost and the sensitive nature of mine detection have resulted in a limited number of freely available datasets, which hampers research progress. To address this gap, we participated in the ROCX (RIT Open Community eXperiment), a large-scale remote sensing data collection effort. Within ROCX, a dedicated data collection campaign was conducted focusing on the detection of PFM-1 anti-personnel landmines. The resulting dataset includes synchronized hyperspectral and multispectral imagery, as well as LiDAR point clouds, acquired during daylight conditions across multiple sessions. Ground-based data was collected using a relatively low-cost, portable sensor rig designed for close-range mine detection. This rig integrates multiple electro-optical sensors with a compact LiDAR system, enabling simultaneous mine detection, localization, and full-scene 3D reconstruction of the minefield. In parallel, high-cost airborne hyperspectral data was acquired using both drone-based and plane-based platforms, providing complementary top-down coverage. The resulting dataset enables the exploration of novel research directions in electro-optical mine detection. In particular, it supports systematic studies of platform-dependent performance, sensor fusion, and multi-view target detection by combining oblique ground-based observations with aerial data.</p>			
<b>Authors</b>				
first name	last name	email	country	affiliation
Charles	Hamesse	charles.hamesse@mil.be	Belgium	Royal Military Academy
Hannes	De Meulemeester	Hannes.DeMeulemeester@mil.be	Belgium	Royal Military Academy
Rob	Haelterman	rob.haelterman@mil.be	Belgium	Royal Military Academy

Title	ROCX 2025: A Multi-Sensor UAV and Ground-Based Experiment for Surface PFM-1 Landmine Detection			
Author keywords	landmine detection UAV drones data collection sensors pfm1			
Abstract	<p>Surface-laid anti-personnel landmines remain a critical humanitarian hazard in post-conflict regions, where detection is limited by safety risks, environmental complexity, and the lack of realistic, openly documented datasets. The PFM-1 anti-personnel mine is particularly challenging to detect due to its small size, low metallic content, and deployment across heterogeneous natural backgrounds. To address these challenges, a controlled field experiment was conducted during the ROCX 2025 campaign to collect multi-sensor data under operationally relevant conditions. The experiment involved the fabrication and deployment of 110 three-dimensionally printed replicas of PFM-1 mines across a controlled outdoor test site. The replicas were surface-laid over diverse land-cover types, including bare soil, sparse vegetation, dense vegetation, and mixed clutter, using both structured and scattered placement strategies to emulate realistic dispersal patterns. Ground truth information was recorded during deployment to support quantitative analysis. Data collection was performed using a combination of unmanned aerial vehicle (UAV)-based and ground-based sensing systems. UAV-mounted sensors enabled wide-area coverage and reduced risk to human operators, while complementary ground-based measurements provided higher-resolution observations and reference data. The sensing suite was designed to capture key environmental challenges such as background heterogeneity, vegetation-induced occlusion, shadowing, and illumination variability. This work introduces the experimental design, sensor configurations, and data collection methodology, and provides an overview of the dataset to be released following the campaign. The ROCX 2025 dataset is intended to support systematic evaluation of sensing modalities and detection approaches for humanitarian demining applications.</p>			
<b>Authors</b>				
first name	last name	email	country	affiliation
Sagar	Lekhak	sl3088@rit.edu	United States	Rochester Institute of Technology
Emmet	Ientilucci	eijpci@rit.edu	United States	Rochester Institute of Technology

## Session M2: UAV for Risk Assessment and Management

Title	Evaluation of UAS for Landmine and Unexploded Ordnance			
Author keywords	UAS Unexploded Ordnance Landmines Multispectral Imaging Soil conditions			
Abstract	<p>Uncrewed Aircraft Systems (UAS) have significantly transformed surveying practices across multiple industries, including agriculture, construction, defense, and emergency response. In recent years, humanitarian organizations have increasingly adopted UAS technology in post-conflict regions to aid in the detection of landmines and unexploded ordnance (UXO). These explosive remnants of war continue to affect communities worldwide, often persisting decades after conflicts have ended. Their presence poses long-term safety risks, restricts land use, and hinders economic and social development. Traditional UXO detection methods typically require trained technicians to enter suspected hazardous areas on foot, relying on manual techniques or handheld detection tools. These approaches are not only time-consuming but also place human lives at significant risk. In contrast, UAS-based surveying enables remote data collection, reducing direct human exposure and improving operational safety during detection activities. This study examines the effectiveness of UAS surveys for landmine and UXO detection through the use of multiple sensing technologies, including ground-penetrating radar and multispectral imaging, which includes RGB, near infrared (NIR), and ultraviolet (UV) bands. Each technology offers unique advantages and limitations when applied to explosive detection. The research specifically analyzes how environmental factors, such as soil type, soil moisture, and varying weather conditions, affect the performance and reliability of these sensing methods. By evaluating these variables, this study aims to identify the limitations and opportunities different environmental factors have on UXO and landmine detection with these technology types.</p>			
<b>Authors</b>				
first name	last name	email	country	affiliation
Alaura	Kanell	alaura.kanell@okstate.edu	United States	Oklahoma State University
Jamey	Jacob	jdjacob@okstate.edu	United States	Oklahoma State University

Title	A compact drone payload to monitor gaseous emission products			
Author keywords	payload gas sampling inexpensive			
Abstract	<p>We have developed a small, UAV-independent payload to monitor gaseous emission products from combustion, explosive detonations, or other sources. The payload is complete with an internal power supply, GPS receiver, and local data storage and is adaptable to a wide range of gas sensors that use I2C, RS232-serial, or analog interfaces. Data is stored locally but can also be telemetered to a ground receiving station via LoRa or other radio transmission technologies. We will show results for NO<sub>2</sub> measurements from large-scale mining and quarrying detonations in the United States, Panama, and elsewhere.</p>			
<b>Authors</b>				
first name	last name	email	country	affiliation
Robert	Kremens	kremens@cis.rit.edu	United States	Rochester Institute of Technology
Emmett	Ientilucci	emmett@cis.rit.edu	United States	Rochester Institute of Technology
Martin	Held	martin.held@austin powder.com	United States	Austin Powder, Inc.

Title	UAV-Based 3D Reconstruction and Modeling of Blast-Induced			
Author keywords	Structure-from-Motion (SfM) 3D Terrain Reconstruction Change Detection Muckpile Modeling Blast Simulation Digital Twin Unmanned Aerial Vehicles (UAV)			
Abstract	<p>Accurate characterization of post-blast muckpile geometry is essential for mining efficiency, yet predicting material redistribution remains challenging. This study presents a UAV-enabled workflow for quantitative 3D reconstruction and preliminary modeling of blast-induced terrain change. High-resolution UAV videos were acquired before and after controlled bench blasts. Structure-from-Motion (SfM) was used to generate 3D surface models of pre- and post-blast terrain, enabling direct volumetric and spatial change analysis. In a representative case, displacement volume increased from <math>2.55 \times 10^5 \text{ m}^3</math> to <math>3.75 \times 10^5 \text{ m}^3</math>, consistent with the experiential 1.33–1.50× swell factor range, demonstrating that UAV-derived models effectively capture large-scale material redistribution. A physics-informed simulation environment was developed in the 3D graphics suite, Blender, to approximate fragment motion and muckpile formation. Preliminary comparisons show consistent global displacement trends. Ongoing work integrates geometric similarity metrics to quantitatively assess model fidelity and support future data-driven prediction. This work demonstrates the potential of UAV-derived 3D models to serve as both a quantitative measurement tool and a validation backbone for predictive blast modeling.</p>			
<b>Authors</b>				
first name	last name	email	country	affiliation
Fei	Zhang	fzhcis@rit.edu	United States	Rochester Institute of Technology
Michael	Gartley	mxgpci@rit.edu	United States	Rochester Institute of Technology
Emmett	Ientilucci	ejipci@rit.edu	United States	Rochester Institute of Technology

## Session M3: UAV for Vegetation and Forestry

Title	AiDroneTree: A Software for Automatic Individual Tree Detection, Inventory, and Biomass Estimation Using UAV Point Cloud
Author keywords	<p>Individual Tree Detection            AiDroneTree            Tree-Net            Tree Inventory            Deep learning            AI            UAV            LiDAR            Software</p>
Abstract	<p>Forest monitoring and management require accurate tree parameter information for informed policy-making and investment decisions. Currently, tree information is being measured by crew and traditional methods such as on-site plot measurements. Traditional methods provide limited information as they rely on manpower and are costly, time-consuming, and labor-intensive. On the other hand, remote sensing data combined with advanced Artificial Intelligence (AI) techniques can offer solutions to these limitations, but are challenging for non-experts to adopt and use. Therefore, having a tool that implements these advanced techniques and makes them accessible to non-expert users is essential. To address this, we present AiDroneTree, a user-friendly Graphical User Interface (GUI) software designed for Individual Tree Detection (ITD) and parameter estimation by implementing our previously developed deep learning individual tree detector, named Tree-Net, on Unmanned Aerial Vehicle (UAV)-derived point clouds. AiDroneTree automatically detects and segments individual trees and estimates their parameters including locations, height, volume, crown diameter, 3-dimensional (3D) surface area, above ground biomass (AGB), and carbon storage using Tree-Net AI deep learning algorithm from UAV-derived point clouds. In addition, AiDroneTree includes supplementary pre- and post-processing tools, including point cloud filtering; Digital Surface Models (DSM), Digital Terrain Models (DTM), and Canopy Height Models (CHM) generation; data visualization; exporting outputs in standard formats compatible with third-party software such as ArcGIS; and GIS query functionalities. The core software is written in Python and comprises three main components: GUIs, processing modules, and exporting modules. AiDroneTree simplifies the application of advanced AI-based forest inventory techniques for operational, non-expert users. It also offers an intuitive and user-friendly interface that allows a broad range of users, including public sector organizations such as municipalities, as well as private companies in the area of timber harvesting and utilities, to efficiently calculate valuable tree parameters. The quantitative assessment of AiDroneTree shows high performance with a best recall of 0.82 and an F1-score of 0.85 on the ForInstance benchmark. On an independent dataset collected by us, it achieved a recall and F1-score of 0.92. Furthermore, the software attained a root mean square error (RMSE) of 30 cm for height estimation (<math>R^2 = 0.99</math>) and 225.6 kg for Above Ground Biomass (AGB) estimation (<math>R^2 = 0.76</math>). The software showed</p>

consistent performance across a variety of forest environments, from sparse to dense canopies, and performed well on multiple types of point cloud data, including UAV-derived LiDAR, photogrammetric point clouds, and terrestrial laser scanner point clouds. The AiDroneTree demonstrates high processing efficiency by delivering a complete end-to-end output for a 5-hectare area in just 30 minutes, from initial data import to final generation. AiDroneTree will help municipalities and private companies not only to reduce their tree inventory cost and time but also to generate valuable data for future analysis and archiving.

<b>Authors</b>				
first name	last name	email	country	affiliation
Sina	Jarahizadeh	sjarahizadeh@esf.edu	United States	Ph.D. Candidate at SUNY ESF Department of Environmental Resources Engineering
Bahram	Salehi	bsalehi@esf.edu	United States	Assistant Professor at SUNY ESF Department of Environmental Resources Engineering

Title	Enhancing Individual Tree Biomass Estimation in Dense Forest and Urban Environments Using UAV LiDAR Through Training Data Augmentation
Author keywords	Above Ground Biomass Individual Tree Detection UAV LiDAR SMOTE Data Augmentation Machine Learning
Abstract	Quantifying individual tree Above Ground Biomass (AGB) enables feasible assessment of the ecological services provided by trees in both forested and urban environments. AGB is not only important for understanding trees' ecological functionality in forested areas, but also for enumerating urban heat island, stormwater regulation, and air quality improvement. Conventional field-based techniques for estimating the individual tree AGB are expensive, labor-intensive, and time-consuming. On the other hand, in recent years, remote sensing imagery has offered a scalable and cost-effective alternative; however, the spatial resolution of satellite- and aerial-based techniques is not efficient for estimating the AGB at the individual tree level. In contrast, UAV-captured Light Detection and Ranging (LiDAR) data provides high-resolution and detailed tree structure geometry point clouds, which can be used to estimate structural

parameters such as Height (H), Surface Area (SA), Volume (V), and Crown Width (CW). These parameters can then be used to estimate individual tree AGB using Machine Learning (ML) regressors such as Random Forest (RF) as an alternative to allometric equations. To do so, we present a few-step workflow to estimate the AGB. The first step is to detect and estimate the individual tree parameters by utilizing our previously developed deep learning algorithm, called Tree-Net. The second step estimates the AGB using the RF ML regressor by incorporating all possible combinations of tree parameters as input. Then, the optimal model input combination was determined using RMSE and  $R^2$  metrics and selected for the AGB estimation. A common challenge with such datasets is the imbalance in training samples (i.e., ground truth data), which can cause the regressor to underestimate AGB at higher values and overestimate it at lower values. To address this issue and improve RF model robustness for AGB estimation, we integrated the Synthetic Minority Over-sampling Technique (SMOTE) data augmentation with RF (RF-SMOTE) to generate more training samples. Results from testing different input combinations indicated that, among single-input RF estimators, CW alone achieved the best performance, whereas H alone performed the worst. However, the RF model combining H and CW outperformed all other input parameter combinations in estimating AGB by achieving an RMSE of 284 kg and an  $R^2$  of 0.53. Applying SMOTE for data augmentation prior to training the RF model improved RF performance by reducing the RMSE to 229.4 kg and increasing  $R^2$  to 0.75. This improvement was particularly noticeable in the underrepresented low and high AGB ranges. The proposed RF-SMOTE method combined with the Tree-Net individual tree detection deep learning model can be used as a cost-effective and scalable strategy to generate accurate ground truth/training data that is needed for satellite-driven biomass estimation models. This method can also support forest and urban planners in carbon accounting, sustainable forest management, biodiversity monitoring, climate change mitigation, and making informed decisions for both urban and forest landscape planning.

#### Authors

first name	last name	email	country	affiliation
Sina	Jarahizadeh	sjarahizadeh@esf.edu	United States	Ph.D. Candidate at SUNY ESF Department of Environmental Resources Engineering
Bahram	Salehi	bsalehi@esf.edu	United States	Assistant Professor at SUNY ESF Department of Environmental Resources Engineering

Title	Subcanopy man-made-object detection from discrete point clouds
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Author keywords	lidar machine learning subcanopy man-made-object detection			
Abstract	<p>Airborne light detection and ranging (LiDAR) enables limited understory sensing in forested environments due to forest radiometry and system limitations, where object detection performance, for instance, is strongly affected by canopy structure. In this study, we systematically evaluate the detectability of man-made objects under varying canopy conditions using both 2D (rasterized) and 3D (voxelized) convolutional neural network models. We augment the PureForest dataset by injecting synthetic target objects into real forest LiDAR point clouds spanning multiple forest types with diverse canopy densities, thereby enabling a fully controlled experimentation environment. We quantitatively test the hypothesis that detection performance increases with the number of LiDAR returns sampled from an object and to what extent. Across targets representing three classes with varying sizes, we identify detectability thresholds, imposed primarily by canopy-mediated LiDAR, which limits the number of returns originating from the understory. Larger objects (<math>\sim 25 \text{ m}^2</math>) require approximately 180 object returns, while medium-sized objects (<math>\sim 10 \text{ m}^2</math>) require around 60 object returns to achieve recall above 0.5; this corresponds to an effective understory object sampling density of approximately <math>6 \text{ pts/m}^2</math>. These findings indicate that sensing constraints impose fundamental limits on sub-canopy object detection. The study provides quantitative guidelines linking acquisition conditions, canopy structure, and achievable detection performance, while offering practical insights for mission planning and development of sensing-aware detection algorithms in forested environments.</p>			
<b>Authors</b>				
first name	last name	email	country	affiliation
Jan	Wasilewski	jw7630@g.rit.edu	United States	Rochester Institute of Technology
Jan	van Aardt	jvacis@rit.edu	United States	Rochester Institute of Technology
Bartosz	Krawczyk	bartosz.krawczyk@rit.edu	United States	Rochester Institute of Technology

Title	Surface2Terrain: A Web-Based Tool for Generating Digital Terrain and Canopy Height Models from Drone Imagery				
Author keywords	precision agriculture open source web application vegetation structure elevation terrain				
Abstract	<p>Drones are vital to capturing high-resolution spectral and structural data in precision agriculture, particularly in vineyards and orchards where individual plants are distinguishable for individual plant analysis. However, high costs and steep learning curves of photogrammetry software remain significant barriers to adoption. Many entry-level platforms (e.g., Pix4Dfields, DroneDeploy) provide a Digital Surface Model (DSM) but often omit the Digital Terrain Model (DTM) or gate it behind premium tiers. Without a DTM, users cannot generate a Canopy Height Model (CHM)—an essential layer for characterizing crop status and assessing crop structure. To bridge this gap for non-technical growers and service providers, we developed Surface2Terrain, a free, Python-based web application. The tool allows users to upload a DSM raster and apply simple filtering algorithms to derive and download both the DTM and the resulting CHM. Furthermore, the tool provides a transparent alternative when premium photogrammetry software “black-box” algorithms produce erroneous results without allowing for user-guided adjustments.</p>				
<b>Authors</b>					
	first name	last name	email	country	affiliation
Robert	Chancia	roccis@rit.edu	United States		Rochester Institute of Technology

## Session M4: UAV Data Processing

Title	Low Costs Tools and Techniques for Characterization of Hyperspectral Imaging Sensors			
Author keywords	Hyperspectral Imagers Characterization Calibration Low-cost			
Abstract	<p>Drones are vital to capturing high-resolution spectral and structural data in precision agriculture, particularly in vineyards and orchards where individual plants are distinguishable for individual plant analysis. However, high costs and steep learning curves of photogrammetry software remain significant barriers to adoption. Many entry-level platforms (e.g., Pix4Dfields, DroneDeploy) provide a Digital Surface Model (DSM) but often omit the Digital Terrain Model (DTM) or gate it behind premium tiers. Without a DTM, users cannot generate a Canopy Height Model (CHM)—an essential layer for characterizing crop status and assessing crop structure. To bridge this gap for non-technical growers and service providers, we developed Surface2Terrain, a free, Python-based web application. The tool allows users to upload a DSM raster and apply simple filtering algorithms to derive and download both the DTM and the resulting CHM. Furthermore, the tool provides a transparent alternative when premium photogrammetry software “black-box” algorithms produce erroneous results without allowing for user-guided adjustments.</p>			
<b>Authors</b>				
first name	last name	email	country	affiliation
Tom	Chrien	tchrien@matter.com	United States	Matter Intelligence, Inc.
Chris	Chovit	chris.chovit@matter.com	United States	Matter Intelligence, Inc.
Jacob	Kuhlman	jacob.kuhlmann@matter.com	United States	Matter Intelligence, Inc.
Evan	Gould	evan.gould@matter.com	United States	Matter Intelligence, Inc.
Zachary	Chrien	zack.chrien@matter.com	United States	Matter Intelligence, Inc.
Seth	Curtin	seth.curtin@matter.com	United States	Matter Intelligence, Inc.

Title	Establishing Baseline Forest Biomass and Carbon Stock Using UAV LiDAR: Evidence from AINU BHATTI FOREST, PUNJAB			
Author keywords	Allometric Equations UAV LiDAR Forest Biomass Carbon Stock Baseline Assessment			
Abstract	<p>Accurate estimation of forest aboveground biomass (AGB) is essential for sustainable forest management and carbon stock assessment. However, conventional field-based forest inventories are labor-intensive, costly, and spatially limited. Advances in unmanned aerial vehicle (UAV) based LiDAR provide a practical alternative by enabling high-resolution three-dimensional characterization of forest structure. This study presents a UAV LiDAR-based framework for establishing baseline forest biomass and carbon stock estimation over AINU BHATTI FOREST, PUNJAB, covering an area of approximately 271.48 Acre dominated by species such as: <i>Dalbergia sissoo</i>, <i>Conocarpus erectus</i>, <i>Eucalyptus</i>, <i>Mulberry</i>, and <i>Java plum</i>, representing one of twenty forest locations selected under the Government of Punjab initiative GIS-Based Protection Regime and Establishment of Digital Communication Cell. Concurrent in-situ measurements and UAV LiDAR data were collected during 4-10 November, 2025, resulting in approximately 998 in-situ samples over 21 ground circular sample plots and computationally 25 GB of LiDAR point cloud data. Flight planning and data acquisition were conducted using a Zenmuse L2 onboard DJI Matrice 350 RTK equipped with an enterprise-grade remote controller DJI RC Plus, operated at an altitude of 150m for triple-direction independent scan geometries (45°, 90°, 45°), yielding an average point density of 320 points m<sup>-2</sup>. LiDAR data were preprocessed using DJI Terra platform. Further bulk amount of data processed followed by post processing in Global Mapper, including filtration i.e. noise removal, ground and non-ground classification, individual tree extraction, and derivation of structural metrics such as tree height and crown spread. AINU BHATTI FOREST SPECIES SPECIFIC ALLOMETRIC EQUATIONS WERE APPLIED TO ESTIMATE AGB AND CORRESPONDING CARBON STOCK ACROSS NINE FOREST COMPARTMENTS. MODEL PERFORMANCE WAS EVALUATED ACHIEVING PROMISING OVERALL COEFFICIENT OF DETERMINATION (R<sup>2</sup>) OF 0.87. FINALLY, SPATIALLY EXPLICIT BIOMASS AND CARBON STOCK MAPS WERE GENERATED AT A RESOLUTION OF 6CM YIELDING CARBON STOCK VALUE OF OVER 130 TONNES. THE RESULTS DEMONSTRATE THE STRONG POTENTIAL APPLICATION OF UAV LiDAR FOR HIGH-RESOLUTION BASELINE FOREST BIOMASS AND CARBON STOCK MAPPING, SUPPORTING FOREST MONITORING AND CARBON ACCOUNTING IN DATA-SCARCE REGIONS.</p>			
<b>Authors</b>				
first name	last name	email	country	affiliation
Muhammad Muzamil	Khan	muzamil.khan@fmis.pk	United States	GIS Lab, Punjab Forestry & Wildlife Department, Lahore, Pakistan

Shahid	Imran	sash.space@gmail.com	Pakistan	GIS Lab, Punjab Forestry & Wildlife Department, Lahore, Pakistan
Rabia Munsaf	Khan	rkhan06@syr.edu	Pakistan	State University of New York College of Environmental Science and Forestry

Title	A Quarriable Earth: Semantic Search and Change Detection in Aerial Imagery using Vector Embeddings			
Author keywords	AI remote sensing image processing vector embeddings search and discovery change detection			
Abstract	<p>Recent advancements in AI provide powerful new methods to analyze aerial imagery, offering capabilities that go beyond traditional metadata-based cataloging. This presentation explores the practical application of vector embeddings—compact numerical representations of visual data—to enable scalable semantic search and change detection in high-resolution aerial datasets. We discuss "Queryable Earth," a workflow demonstrating how these embeddings allow users to query imagery using natural language (e.g., "solar panels," "flooded roads") and identify meaningful changes by analyzing shifts in vector space rather than simple pixel differences. Our evaluation highlights the operational feasibility of this approach. While embedding generation entails computational costs, our analysis shows the resulting storage footprint is minimal (approximately 0.07% of the source data size) making it efficient to store and distribute these "semantic indices" alongside standard imagery. We further explore cost optimization strategies such as efficient tiling and dimensionality reduction. The session will conclude with a live demonstration utilizing NAIP data as a high-resolution proxy for UAS photogrammetry. We will showcase real-time search and change detection to illustrate how these emerging AI techniques can be leveraged to extract immediate value from massive aerial archives.</p>			
<b>Authors</b>				
first name	last name	email	country	affiliation
Matthew	Hanson	matt.a.hanson@gmail.com	United States	LGND AI

Title	Unsupervised Characterization of Vertical Atmospheric Structures for Adaptive UAS Sampling			
Author keywords	Uncrewed Aerial Systems (UAS) Unsupervised Learning Adaptive Sampling Planetary Boundary Layer Atmospheric Profiling			
Abstract	<p>Historically, observations of the lowest layer of Earth’s atmosphere (i.e., the planetary boundary layer or PBL) have been sparse. While there are several methods to observe the upper atmosphere (e.g., satellites) and the surface (e.g., automated weather stations), the layer in between is only routinely sampled twice daily by radiosondes. Uncrewed Aerial Systems (UAS) offer a flexible solution to bridge this critical data gap; however, efficient deployment requires intelligent sampling strategies. To address this, this study presents a framework for minimum error adaptive sampling of atmospheric vertical temperature profiles using unsupervised learning. The long-term objective is to enable UAS to predict vertical profiles and autonomously make real-time sampling decisions. As a prerequisite to real-time implementation, this work focuses on developing a framework for fundamental atmospheric patterns. By clustering weather profiles based on geometric shape and curvature, this research demonstrates how a flight computer can recognize distinct structures (e.g., temperature inversions) to categorize the environment before adaptive sampling logic is applied effectively.</p>			
<b>Authors</b>				
first name	last name	email	country	affiliation
Alejandro	Medina	amedina64@miners.utep.edu	United States	UTEP
Hernan	Moreno	moreno@utep.edu	United States	UTEP
Luis	a de la Fuente	ladelafuenteco@utep.edu	United States	UTEP
Elizabeth	Smith	elizabeth.smith@noaa.gov	United States	NOAA - National Severe Storms Laboratory
Miguel	Velez-Reyes	mvelezreyes@utep.edu	United States	UTEP

## Session T1: UAV for Construction & Building

Title	Comparative Evaluation of Uncrewed Aerial Systems (UAS)-Based Bridge Inspection Results Against Routine Engineering Inspection			
Author keywords	Uncrewed Aerial Systems (UAS) Bridge Inspection 3D Reconstruction Pix4Dmapper			
Abstract	<p>Uncrewed Aerial Systems (UAS) are increasingly adopted to support bridge inspection by improving access to high-elevation and difficult-to-reach elements while reducing safety risks and traffic disruptions. However, the extent to which UAS-based observations and derived 3D models can reproduce findings from routine engineering inspections remains an open question for transportation agencies. This study presents a comparative evaluation of UAS-derived inspection results and three-dimensional (3D) bridge models against official routine inspection reports for two Connecticut Department of Transportation (CTDOT) highway bridges along Interstate 91 in New Haven, Connecticut. A DJI Mavic 3T UAS equipped with Real-Time Kinematic (RTK) positioning was deployed to capture high-resolution imagery of deck surfaces, superstructure steel, and substructure components. The collected imagery was processed using Pix4Dmapper to generate 3D models supporting spatial visualization and condition assessment. Observed deficiencies, including cracking, joint deterioration, corrosion, leakage, and minor impact damage, were compared qualitatively with findings documented in recent CTDOT routine inspection reports. Results indicate that UAS imagery and Pix4Dmapper-generated 3D models successfully reproduced a substantial portion of reported deficiencies, particularly for superstructure and fascia-level elements, with strong agreement in defect type and spatial location. Limitations were observed for condition attributes requiring tactile inspection or precise physical measurements. Despite these constraints, the integration of UAS imagery and 3D modeling demonstrates strong potential to complement traditional inspection workflows by enhancing visual documentation, spatial context, and inspection efficiency. This work supports the use of UAS-based imaging and 3D reconstruction as practical supplemental tools for bridge inspection aligned with established DOT inspection practices.</p>			
<b>Authors</b>				
first name	last name	email	country	affiliation
Samin	Mirzaghanbarpour	smirz6@unh.newhaven.edu	United States	Graduate Research Assistant, University of New Haven
Saeed	Jafari Kang	bluesolutions.ct@gmail.com	United States	CTO, Blue Solutions
Reihaneh	Samsami	RSamsami@newhaven.edu	United States	Assistant Professor, University of New Haven

Title	Integrating Uncrewed Aerial Systems (UAS)-Based 3D Photogrammetric Modeling and Deep Learning for Bridge Deck Crack Detection: An MDOT Case Study
Author keywords	Uncrewed Aerial Systems (UAS) Bridge Inspection Crack Detection 3D Reconstruction Pix4Dmapper Object Detection Deep Learning YOLO
Abstract	<p>Uncrewed Aerial Systems (UAS) and photogrammetric reconstruction have created new opportunities for active bridge inspection; however, translating high-resolution imagery into actionable defect information remains a challenge. This study presents a practical crack detection workflow using a real-world bridge dataset derived from a UAS-based inspection of the Beyer Road Bridge, Michigan. High-resolution deck imagery was captured using a drone platform and processed in Pix4Dmapper to generate a photogrammetric 3D model, orthomosaic, and inspection-quality image products. From these Pix4D-derived outputs, a dataset of 900 image patches was systematically extracted and manually annotated using bounding boxes to localize surface cracks. Crack detection was formulated as an object detection problem, and the performance of three state-of-the-art YOLO-based architectures (YOLOv8, YOLOv11, and YOLOv26) was evaluated and compared. Results demonstrate that modern YOLO variants can reliably localize cracks in real bridge imagery, with newer architectures showing improved detection consistency and reduced false positives. The proposed workflow highlights the feasibility of integrating UAS-enabled 3D reality capture with deep learning-based crack detection to support inspection screening and condition assessment, enabling defect localization within a broader spatial context derived from photogrammetric modeling. By grounding model evaluation in a real bridge inspection setting, this study contributes practical insights into deploying object detection models for infrastructure inspection and establishes a foundation for future extensions toward crack segmentation and quantitative damage assessment.</p>

**Authors**

first name	last name	email	country	affiliation
Samin	Mirzaghanbarpour	smir6@unh.newhaven.edu	United States	Graduate Research Assistant, University of New Haven
Sharmin	Jahan Badhan	sbahd2@unh.newhaven.edu	United States	Graduate Research Assistant, University of New Haven
Reihaneh	Samsami	RSamsami@newhaven.edu	United States	Assistant Professor, University of New Haven

Title	Combining UAS Photogrammetry and Terrestrial Laser Scans to Create a Full 3D Building Model
Author keywords	Photogrammetry Point cloud Laser scan Terrestrial
Abstract	We present the results of an effort to create a 3D model of the Saint George Theater on Staten Island, New York. A UAS was used to create a photogrammetric model of the general site area and building roof, while terrestrial laser instruments were used to scan the interior of the building and details of the outer walls. Both 3D point clouds were successfully merged into a single cohesive model of the building.

#### Authors

first name	last name	email	country	affiliation
William	Stiteler	william.stiteler@arcadis.com	United States	Arcadis
Adam	Guadagnoli	adam.guadagnoli@arcadis.com	Canada	Arcadis
Nikki	Karpf	nikki.karpf@arcadis.com	United States	Arcadis
Donald	Reed	don.reed@arcadis.com	United States	Arcadis

Title	UAS-Delivered versus Human-Placed Training Aids for Detection K9s			
Author keywords	unmanned aerial systems detection dogs payload delivery			
Abstract	<p>The efficacy of detection K9s for emergency response hinges on their reliability to search for odor. Handlers traditionally manually place training aids out in the field to teach K9s to search, but unmanned aerial systems (UAS) can deploy these aids with greater speed, minimize human bias in placement, and prevent a trail of crushed vegetation produced by the handler for the K9 to track. We will share the results of detection K9 performance in trials with UAS-delivered versus human-placed training aids during exterior searches in a controlled field experiment, with a GPS collar tracking search patterns, the amount of area covered, and the amount of time to find the target. UAS-delivered hides for detection K9 training can improve air-scenting capabilities that could enhance the reliability of search operations.</p>			
<b>Authors</b>				
first name	last name	email	country	affiliation
Katherine	Baronowski	kbaronowski@albany.edu	United States	College of Emergency Management, Homeland Security, and Cybersecurity
Eric	Best	ebest@albany.edu	United States	College of Emergency Management, Homeland Security, and Cybersecurity

## Session T2: UAV Hardware and Sensor

Title	Small UAS–Deployable Ultra-Light Time-Domain Electromagnetic Induction Sensor			
Author keywords	Electromagnetic induction Geophysical mapping Remote sensing			
Abstract	<p>Unmanned aerial systems (UASs) are a critical advance in expanding remote geophysical sensing, particularly for detecting, mapping, classifying, and remediating buried explosive hazards (BEH). BEH, or explosive remnants of war (ERW), including unexploded ordnance (UXO) and land and naval mines, pose a persistent global challenge affecting both developed and developing nations. These hazards affect human life, economic activity, and environmental health, especially in conflict-ridden regions. Southeast Asia, Africa, the Middle East, and Europe are heavily impacted, where past and ongoing hostilities have left substantial ERW contamination. Recent advances in UAS technology, including increased payload capacity, improved flight stability, and broad operational adoption, afford new opportunities for faster, safer, and cost-effective remote sensing and geophysical mapping. UAS platforms can access difficult or hazardous terrain and rapidly survey large areas, enabling more efficient BEH detection and identification. Over the past 30 years, advanced time-domain electromagnetic induction (TDEMI) sensors have been developed for detecting and classifying subsurface metallic targets. However, many COTS EMI systems (e.g., MM2x2, APEX, MPV-II, UltraTEMA) use legacy electronics and outdated data acquisition with coarse sampling rates (&lt;500 kS/s), hand-wound receiver coils, and non-optimized amplifiers. Consequently, they are bulky (&gt;100 lb) and unsuitable for small UAS platforms. This paper presents a UAS-mountable ultra-lightweight electromagnetic array, ULEMA-A (Air). The ULEMA-A weighs 15.3 lb and is designed for deployment on small UAS platforms. We demonstrate system deployment, data collection, and data-processing workflow. Detection and classification performance are evaluated and compared with land-based commercial off-the-shelf (COTS) EMI systems, with emphasis on detection and classification depths.</p>			
<b>Authors</b>				
first name	last name	email	country	affiliation
Max	Orman-Kollmar	MaxOK.th@dartmouth.edu	United States	Dartmouth College
David	Lozano	david.lozano@erdc.dren.mil	United States	US Army Engineering Research and Development Center (ERDC)
Michele	Maxson	michele.l.maxson@	United States	US Army

		erdc.dren.mil		Engineering Research and Development Center (ERDC)
Brian	Quinn	Brian.G.Quinn@usa ce.army.mil	United States	US Army Engineering Research and Development Center (ERDC)
Fridon	Shubitidze	fridon.Shubitidze@ dartmouth.edu	United States	Dartmouth College

Title	A Community Powered, Multi Sensor System for Early Wildfire Detection and Coordinated Response			
Author keywords	Community-powered sensing Early wildfire detection Autonomous systems Coordinated emergency response Socio-technical systems			
Abstract	<p>Wildfires cause growing harm to communities, yet many fires are not detected until they have already become dangerous. Today, wildfire detection often depends on infrequent satellite images or reports from people who happen to see a fire, which can delay response during the most critical early moments. This study explores a community powered approach to detecting wildfires earlier by combining low cost sensors, smartphones, autonomous systems, and artificial intelligence into a shared response system. Our analysis of wildfire risk and firefighting infrastructure in California shows that high risk areas in lower income communities are often farther from firefighting stations, making rapid response more difficult. These findings highlight the need for new detection and response models that improve coverage and reduce response time. In response, this study examines how community members and hobbyists can contribute data through inexpensive sensors and mobile devices, while autonomous platforms and systems help verify fire alerts and provide situational awareness. Building on this analysis, the study designs and evaluates a digital platform and mobile app that connects community generated data with firefighters, delivering clear and prioritized alerts to support faster decision making. Overall, the study shows that wildfire detection is not only a technology challenge but also a coordination challenge, and it offers practical guidance for building scalable, community supported early warning systems.</p>			
<b>Authors</b>				
first name	last name	email	country	affiliation
Daniel	Rice	drice@babson.edu	United States	Babson College
Ekaterina	Gnedenko	gnedenko@bu.edu	United States	Boston University

Roman	Rice	roman.g.rice@gmail.com	United States	University of Connecticut
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Title	Model-Based Hardware-in-the-Loop [HIL] Simulation Architecture for Vision-Based UAV Navigation			
Author keywords	drones uav vision fpga navigation april tag pose estimation hardware in the loop			
Abstract	<p>The advent of low-cost hardware and increasingly smaller and faster computing resources and vision systems has ushered in the era of unmanned aerial vehicles or drones as a major disruptive technology in multiple domains. Drone development from the ground up is quite complex and involves combining technologies from several disciplines such as motor control, computer vision, power systems, etc. Due to the complexity of these flying systems, it is beneficial to rapidly iterate in the design and simulation phase as opposed to constantly building and crashing prototype after prototype. We present a vision-based Hardware-in-the-Loop [HIL] architecture where a complete drone flight can be performed in simulation while synthetic images are generated in a 3D virtual environment. These virtual drone camera images are sent to a Field Programmable Gate Array [FPGA] via WiFi where they are processed to determine the drone pose. It is important to note that the image processing pose determination algorithm running on the FPGA is the exact same code to be run during the actual flight. The determined pose is fed back into the software flight simulation in a closed loop fashion, and the process continues till the end of the flight. In this manner, the entire drone flight can be simulated with the vision-based algorithm being vetted on hardware. This paradigm will allow for rapid vision-based navigation development as it nicely helps to bridge the chasm between simulation and flight testing.</p>			
<b>Authors</b>				
first name	last name	email	country	affiliation
Daniel	Kaputa	dskiee@rit.edu	United States	Rochester Institute of Technology
Atharva	Patil	ap4925@rit.edu	United States	Rochester Institute of Technology

# Program Agenda at a Glance

	Day 1: Monday May 18	Day 2: Tuesday May 19
8:00 -8:30	<b>Registration &amp; Breakfast</b>	<b>Registration &amp; Breakfast</b>
8:30 -9:00	<b>Welcome, Opening Remarks</b> Dr. Emmett Ientilucci, RIT & Dr. Bahram Salehi, SUNY-ESF, Conference Co-Chairs Dr. Andre Hudson, Dean, RIT College of Science	<b>Welcome, Opening Remarks</b> Dr. Emmett Ientilucci, RIT & Dr. Bahram Salehi, SUNY-ESF, Conference Co-Chairs Dr. Jan van Aardt, RIT CIS Director Joseph Sirianni, Associate Director, RIT Remote Sensing Group
9:00 -9:30	<b>Keynote</b> Programs and prospects for UAS utility in Agriculture. <i>Dr. Steven Thomson National Program Leader, USDA National Institute Food and Agriculture (NIFA)</i>	<b>Special Session</b> UAV-Related Research and Teaching at RIT Imaging Science and SUNY ESF <i>Dr. Emmett Ientilucci and Dr. Bahram Salehi</i>
9:30 -10:50	<b>Session M1: ROCX Data Collection and Outcomes</b> <b>M11:</b> An Overview of ROCX 2025, <i>John Kerekes and Nina Raqueno, RIT</i> <b>M12:</b> Orientation-Dependent Sub-Pixel Target Detection by Performance in Hyperspectral Imagery, <i>Muskan Kingrani and John Kerekes</i> <b>M13:</b> ROCX UXO Experiment: Large-Scale Multi-Platform Hyperspectral Dataset of PFM-1 Anti-Personnel Landmines, <i>Charles Hamesse, Hannes De Meulemeester &amp; Rob Haelterman</i> <b>M14:</b> ROCX 2025: A Multi-Sensor UAV and Ground-Based Experiment for Surface PFM-1 Landmine Detection, <i>Sagar Lekhak, and Emmett Ientilucci</i>	<b>Session T1: UAV for Construction &amp; Building</b> <b>T11:</b> Comparative Evaluation of Uncrewed Aerial Systems (UAS)-Based Bridge Inspection Results Against Routine Engineering Inspection, <i>Samin Mirzaghanbarpour, Saeed Jafari Kang, and Reihaneh Samsami</i> <b>T12:</b> Integrating Uncrewed Aerial Systems (UAS)-Based 3D Photogrammetric Modeling and Deep Learning for Bridge Deck Crack Detection: An MDOT Case Study, <i>Samin Mirzaghanbarpour, Sharmin Jahan Badhan, and Reihaneh Samsami</i> <b>T13:</b> Combining UAS Photogrammetry and Terrestrial Laser Scans to Create a Full 3D Building Model, <i>William Stiteler, Adam Guadagnoli, Nikki Karpf, and Donald Reed</i> <b>T14:</b> UAS-Delivered versus Human-Placed Training Aids for Detection K9s, <i>Katherine Baronowski and Eric Best</i>
10:50 -11:20	<b>Coffee Break</b>	<b>Coffee Break</b>
11:20 -12:20	<b>Session M2: UAV for Risk Assessment and Management</b> <b>M21:</b> Evaluation of UAS for Landmine and Unexploded Ordnance Detection, <i>Alaura Kanell and Jamey Jacob</i> <b>M22:</b> A compact drone payload to monitor gaseous emission products, <i>Robert Kremens, Emmett Ientilucci, and Martin Held</i> <b>M23:</b> UAV-Based 3D Reconstruction and Modeling of Blast-Induced Muck pile Formation, <i>Fei Zhang, Michael Gartley, and Emmett Ientilucci</i>	<b>Session T2: UAV Hardware and Sensor</b> <b>T21:</b> Small UAS-Deployable Ultra-Light Time-Domain Electromagnetic Induction Sensor, <i>Max Orman Kollmar, David Lozano, Michele Maxson, Brian Quinn, and Fridon Shubitidze</i> <b>T22:</b> A Community Powered, Multi Sensor System for Early Wildfire Detection and Coordinated Response, <i>Daniel Rice, Ekaterina Gnedenko, and Roman Rice.</i> <b>T23:</b> Model-Based Hardware-in-the-Loop [HIL] Simulation Architecture for Vision-Based UAV Navigation, <i>Daniel Kaputa, and Atharva Patil</i>

12:20 -1:00	<b>Lunch / Group Photo / Networking</b>	<b>Lunch / Group Photo / Networking</b>
1:00 -1:30	<b>Workshop - The Rochester Intelligent Imaging Initiative (RI3)</b>	
1:30 -2:50	<p><b>Session M3: UAV for Vegetation and Forestry</b></p> <p><b>M31:</b> AiDroneTree: A Software for Automatic Individual Tree Detection, Inventory, and Biomass Estimation Using UAV Point Cloud, <i>Sina Jarahizadeh and Bahram Salehi</i></p> <p><b>M32:</b> Enhancing Individual Tree Biomass Estimation in Dense Forest and Urban Environments Using UAV LiDAR Through Training Data Augmentation, <i>Sina Jarahizadeh and Bahram Salehi</i></p> <p><b>M33:</b> Subcanopy object detection, <i>Jan Wasilewski, Jan van Aardt, and Bartosz Krawczyk</i></p> <p><b>M34:</b> Surface2Terrain: A Web-Based Tool for Generating Digital Terrain and Canopy Height Models from Drone Imagery, <i>Robert Chancia</i></p>	<p><b>UAV Trivia Game-2, Awards, and Closing Remarks</b></p> <p>Conference Co- Chairs: Dr. Bahram Salehi, SUNY-ESF Dr. Emmett Lentilucci, RIT</p> <p><b>Student Presentations and UAV Trivia Winners</b></p>
2:50 -3:10	<b>Coffee Break</b>	
3:10 -4:30	<p><b>Session M4: UAV Data Processing</b></p> <p><b>M41:</b> Low Cost Tools and Techniques for Characterization of Hyperspectral Imaging Sensors, <i>Tom Chrien, Chris Chovit, Jacob Kuhlman, Evan Gould, Zachary Chrien &amp; Seth Curtin</i></p> <p><b>M42:</b> Establishing Baseline Forest Biomass and Carbon Stock Using UAV LiDAR: Evidence from AINU Bhatti Forest, Punjab, <i>Muhammad Muzamil Khan, Shahid Imran and Rabia Munsaf Khan</i></p> <p><b>M43:</b> A Quarriable Earth: Semantic Search and Change Detection in Aerial Imagery using Vector Embeddings, <i>Matthew Hanson</i></p> <p><b>M44:</b> Unsupervised Characterization of Vertical Atmospheric Structures for Adaptive UAS Sampling, <i>Alejandro Medina, Hernan Moreno, Luis A De la Fuente, Elizabeth Smith, and Miguel Velez-Reyes</i></p>	
4:30 -5:00	<b>UAV Trivia Game-1</b>	
6:00 -8:00	<p><b>Happy Hour</b></p> <p>The Shamrock Inn, 300 Jefferson Rd, Rochester, NY</p>	



## STRATUS 2026 Conference

Systems and Technologies for Remote Sensing Applications  
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