



SOUTH DAKOTAVIEW 2022 - 2023

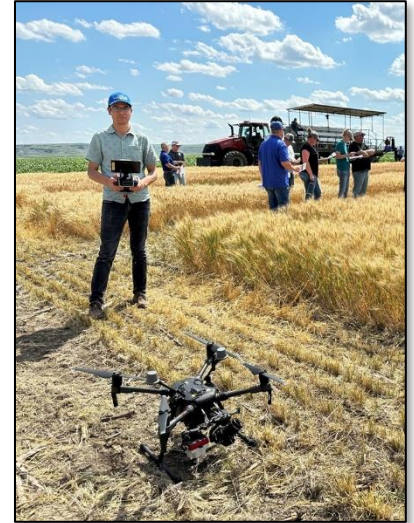
AmericaViewSM
Empowering Earth Observation Education
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SOUTH DAKOTAVIEW 2022 - 2023 ACTIVITIES

Precision Agriculture Project: South DakotaView (SDView) focused on precision agriculture research projects using Uncrewed Aircraft Systems (UAS) and multispectral sensors. The research team investigated the potential of UAS remote sensing and cutting-edge artificial intelligence and machine learning (AI/ML) algorithms in crop health monitoring, crop production, and quality early forecasting. We collected weekly UAS remote sensing data from soybean, wheat, and oat fields across South Dakota in the 2022 and 2023 growing seasons. More than 100 UAS flights and more than 2 Terabytes of multispectral, thermal, and RGB imagery data were collected, calibrated, and processed.

UAS multisensory data fusion and cutting-edge deep learning regression algorithm attention mechanism embedded convolutional neural network (CNN) and Long Short-Term Memory (LSTM) approaches, as well as the Transformer algorithm, were employed to successfully predict corn grain yield, seed protein, and oil concentrations.

UAS remote sensing data and AI/ML algorithms were applied to detect and map crop disease. We have successfully conducted wheat Bacterial Leaf Streak (BLS) and Fusarium Head Blight (FHB) disease detection and mapping using UAS multisensory data and AI/ML methods. The novel approaches examined in this project delivered valuable insight for precision agriculture and crop field management, as well as plant phenotyping with high spatial precision.



Preparing to collect UAS data over one of the South Dakota study sites.



Oglala Lakota College thermal & RGB.



Graduate student Madison DeJarlais demonstrating UAS thermal camera.

- **Lakota Uncrewed Aircraft Systems, Oglala Lakota College & Lower Brule High School:**
 - Onsite Flight Training July 26 & 27, 2023
 - Basic UAS Operations & Advanced/Programmed UAV Operations.
- **2023 Drone Day**
 - April 27th, 2023. SDSU, University Student Union, Exhibit Hall.
- **54th Annual South Dakota State Geography Convention**
 - Thursday, March 30th and Friday, March 31st, 2023.
 - Students presented remote sensing research posters.
 - Interactive display: Physiographic identification from Landsat imagery.
 - South Dakota as Art display. Open to the public (>200 visitors).
- **2023 Big Sioux Water Festival.**
 - May 9, 2023. Exhibit Hall, University Student Union.
 - Mapping Surface Water in South Dakota
- **EROS 50th Anniversary – Rededication. EROS Friends and Family Event:**
 - Saturday, August 19, 2023.
 - Conducted STEM activities using thermal imaging and presented a talk on SDView Accomplishments.

South DakotaView is a member of the AmericaView Consortium, a nationally coordinated network of academic, agency, non-profit, and industry partners and cooperators that share the vision of promoting and supporting the use of remote sensing data and technology within each state. AmericaView is funded by USGS grant agreement G18AP00077.

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BENEFITS TO SOUTH DAKOTA

- Lakota Uncrewed Aircraft Systems** - A collaboration between South Dakota State University / SDView and Oglala Lakota College brought sUAS technology to tribal members at Lower Brule High School, Lower Brule, SD, and Oglala Lakota College, Kyle, SD. Students and tribal members received essential training in the areas of; flight safety operations, manual takeoff, flight, and landing. Students flew a variety of UAS quadcopters at varying altitudes and trained on a variety of flight scenarios and situational awareness conditions.

In addition, they received flight training and the use of cameras on drones to collect aerial images using RGB, thermal, and multispectral cameras. These technologies will be used on reservations by tribal members for various applications and research projects such as hydrological analysis and search & rescue.

Tatuye topa okiyanpi wounspe kagapi – Knowledge in flying the four directions.

- Student Research Support** – Funding in the form of mini-grants and assistantship salaries for students to work on South Dakota precision agriculture projects and present their research at professional meetings.



Mason Maimaitijiang and tribal members flew their drone for the first time.



Graduate student Shahid Khan presenting paper at IGARSS Conference.

SOUTH DAKOTAVIEW CONSORTIUM MEMBERSHIP



**SOUTH DAKOTA
STATE UNIVERSITY**



SOUTH DAKOTA MINES
An engineering, science and technology university



UNIVERSITY OF
SOUTH DAKOTA



LAKE AREA
TECHNICAL COLLEGE



South Dakota Department of
Agriculture & Natural Resources

Federal consortium members identified above do not receive funding from AmericaView.

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<http://www.sdview.org>