



Monroe
Community
College
STATE UNIVERSITY
OF NEW YORK

International Virtual Internships and Research Opportunities in Geospatial Technology for Community College Students



Association of American Geographers (AAG)
March 2023



The *Meeting Workforce Needs for Skilled Geospatial Technicians through Virtual Geospatial Information Science Technology Education* project was funded through the U.S. National Science Foundation (NSF) Office of Advanced Technological Education under Grants Award # 1955256 to Monroe Community College. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.



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International Virtual Internships and Research Opportunities in Geospatial Technology for Community College Students

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Overview

- Provide examples of international virtual internships
- Explain the virtual international internship process at MCC
- Discuss making international connections
- Provide example of student summer research experience with University of Maine – Center for Advance Forestry Systems



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Why international virtual internships?

- Due to technology changes in software and communication, and the impact from the Pandemic, it is now possible for students to work completely remotely through the use of a virtual internship that mirrors the workplace.
- The global nature of many industries requires a reexamination into how the U.S. prepares its students to acquire the necessary technical skills to meet the workforce needs of the future.

Why international virtual internships?

- Diversity, Equity and Inclusion

- Global Perspectives
- Intercultural Awareness
- Workplace flexibility
 - Affordable
 - Work remotely

Alumni Mentoring



Four alumni are providing support to our current students!



A little background

It all started with COIL!



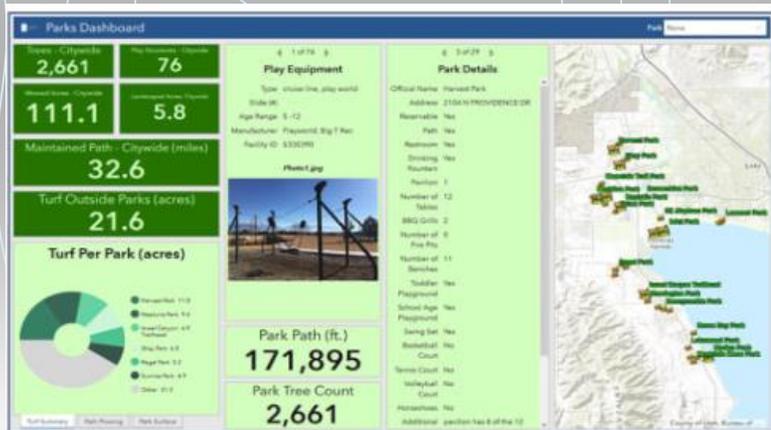
Collaborative Online International Learning
www.coil.suny.edu

- Collaborative Online International Learning (COIL)
- Teaching & learning method which provides innovative cost-effective internationalization
- Impacts on Students
 - Awareness/knowledge of other cultures
 - Understanding of how others perceive us
 - Experiential student learning
- Have adapted this model for virtual internships



Our GIST program

- Developed A.A.S. degree in GIST
 - fully accessible on campus and online
 - Stackable program with 24 credit GIST Certificate.
- Built advanced 9 credit GIST microcredential for professionals
- Support: Alumni GIST mentors
- Great team!
- **Virtual internships in our GIST Capstone course.**



International Virtual Internships

15+ virtual internships, including many in NY state.

7 International virtual internships for students:

- 1) Cartagena, Colombia - used remote to assess changes in mangroves and how it is impacting the city/tourism.



Most internships have a different funding source

- 100,000 Strong in the Americas
- Title: Monitoring Coastline Water Quality in Cartagena, Columbia using GIS Technology and Spanish Consultants: A Hybrid Study Abroad Program



Monroe Community College and Fundación Universitaria Tecnológico Comfenalco



Fundación Universitaria
TECNOLÓGICO COMFENALCO

International Virtual Internships

Partner: Monteverdi Institute

Project: Asses land cover changes in Costa Rica

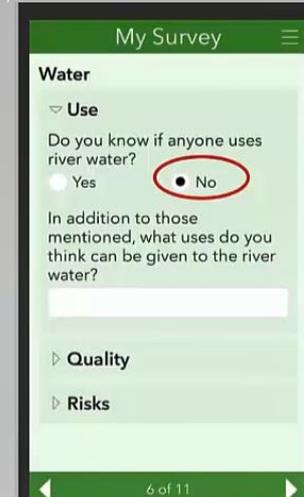
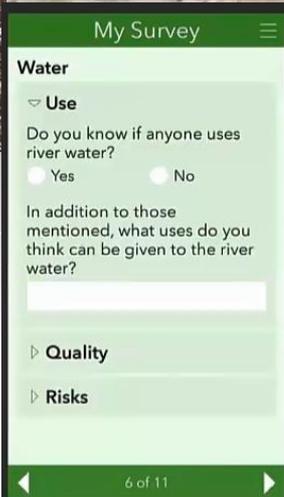
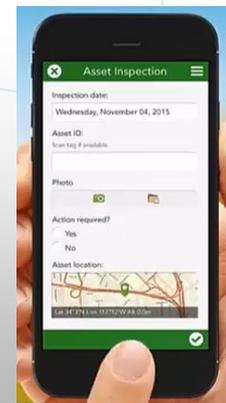
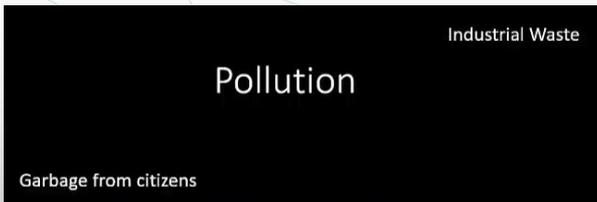
Create maps to display forest connectivity and identify forest and crop species (e.g., coffee)



International Virtual Internships

Partner: Universidad Autónoma de San Luis Potosí

Project: Develop mapping app for local citizens in Mexico to collect water quality data.



Or, some internships are a result of...

- Fulbright Specialist 2019 at Kazakh Agro Tech Univ
- Virtual Internships (3 years!) and Hosted KZ friends!
- Developed app for KZ farmers to collect data on app.



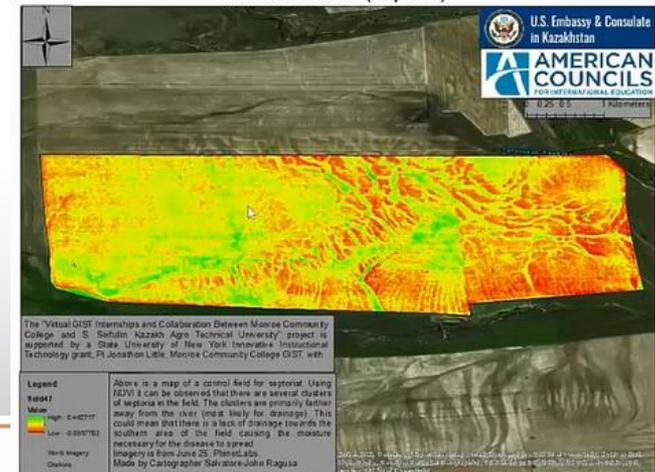
International Virtual Internships

Partner: U.S. Embassy
in Kazakhstan & KATU

Project: Attempt to identify wheat
disease in Kazakhstan
with drone imagery & satellites

Control Fields:

NDVI of Field 47 (Septoria)



Septoria in Plowed Fields (2017 & 2019)

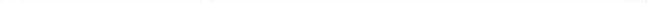
2017 NDVI Map (Landsat)



NDVI Map of Fields near Қорғалжын (2019)



Septoria



International Virtual Internships

Partner: Soils, Food and Healthy Communities

Cornell University CC Internationalization Fellow

Project: Food security in Malawi. Develop mapping app for farmers to collect forest and crop data to assess remote sensing analysis



Project App 2: Forest Inventory

Malawi Forest Inventory

User Information

Name
Zina lina ndimwe njani?

Date & Time of Survey:
Ni nyengo muhanya uno?

Forest Information

Please enter the name or region of the forest.

Is the forest native or planted?

Native
 Planted

What type of forest is it?

Pine
 Eucalyptus
 Evergreen
 Semi-Evergreen
 Deciduous Forest
 The Miombo Woodland
 Afromontane Grassland

What is the quality of the forest?

Low Quality
 Medium Quality
 High Quality

Collect the GPS coordinates of the farm. Refer to Mapping Your Position guide for instructions.

Link: <https://arcgis.com/rsluH>

Malawi
Satellite Imagery
No geometry captured yet.

International Virtual Internships

Partner: Saving Africa's Nature ([SANA](#)), Tanzania

Project: Support SANA with GIS development (e.g., Survey 123) to support reforestation activities including geo-tagging seed collection, planting sites (e.g., location, photo), and monitoring the annual plant growth rate (e.g., tree diameter of DBH) in the reforested site.



App will be available in English and Swahili.

Virtual Internship process and timeline

1. Develop topic (Nov)
2. Host Pre-assessment survey to match organization w/ student skills & interest (Dec).
3. Students entering Capstone Course will develop a resume, share it, and complete the pre-assessment survey (Dec).

GEG 239 Hosts Pre Internship Survey

 Monroe Community College
 Virtual GIST at MCCC

First Name*

Last Name*

Organization*

Note: You may submit more than one project. Click the + below the project group to add another project.

Project 

Project Name* 1

Project Description*
2-5 sentences that describes the scope of the project

Skills expected of the student*
Check all that apply

Project deliverables*
Check all that apply

Virtual Internship process and timeline

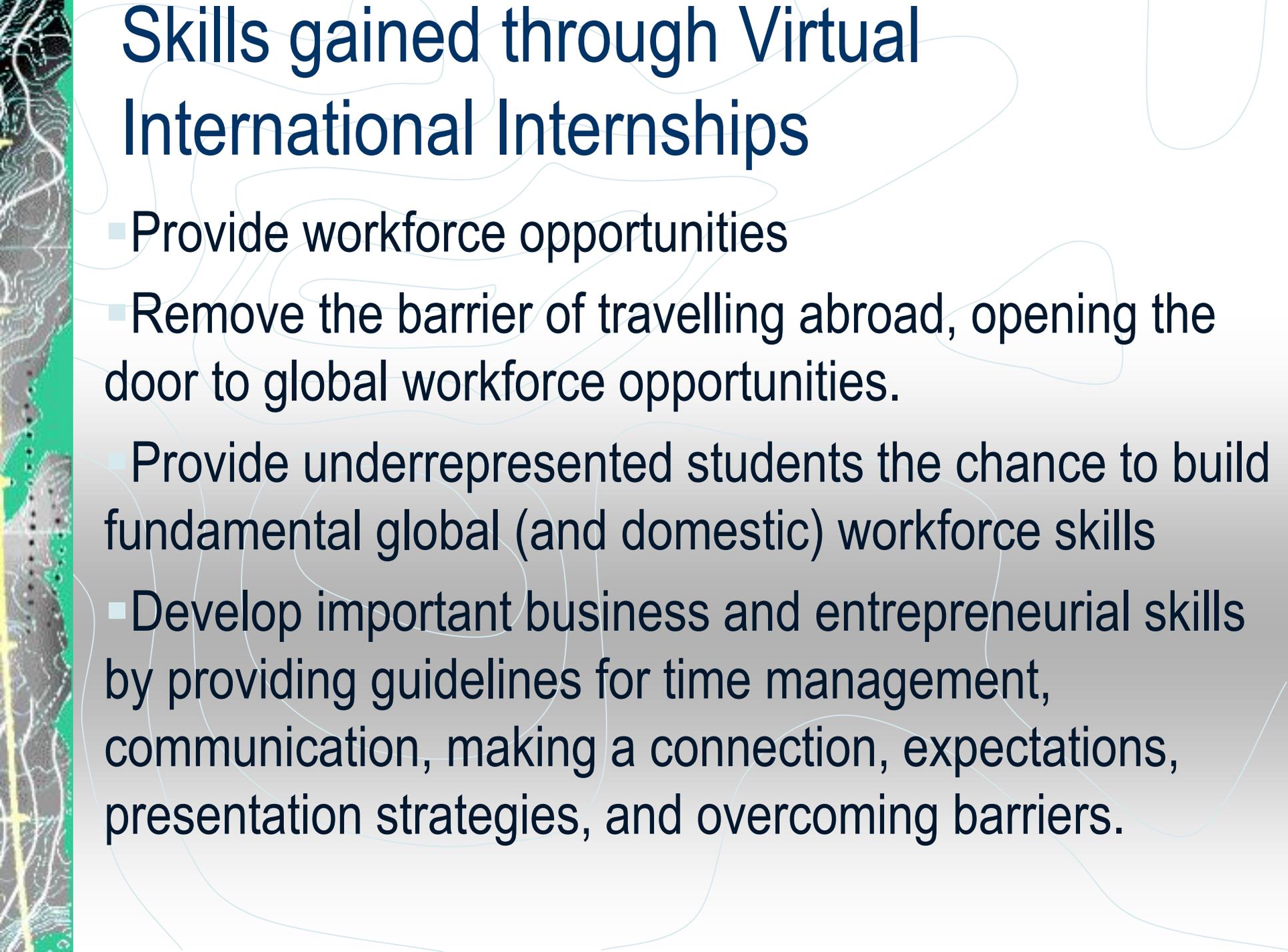
4. Host meets virtually Coordinator to discuss expectations and match (Jan).
5. Student matched with host January.
6. Class begins late January.
7. Student meets with instructor to discuss internship expectations (late Jan/early Feb).
8. Host meets virtually with student via Zoom (early-mid February), and chat via WhatsApp.
9. Host touches base with student weekly (Feb-May)
10. Instructor checks in monthly with host (Feb-May)
11. Student presents/submits deliverables (May)

Virtual Internship process and timeline

12. Post-assessment surveys (mid-May).

Geography & GIST

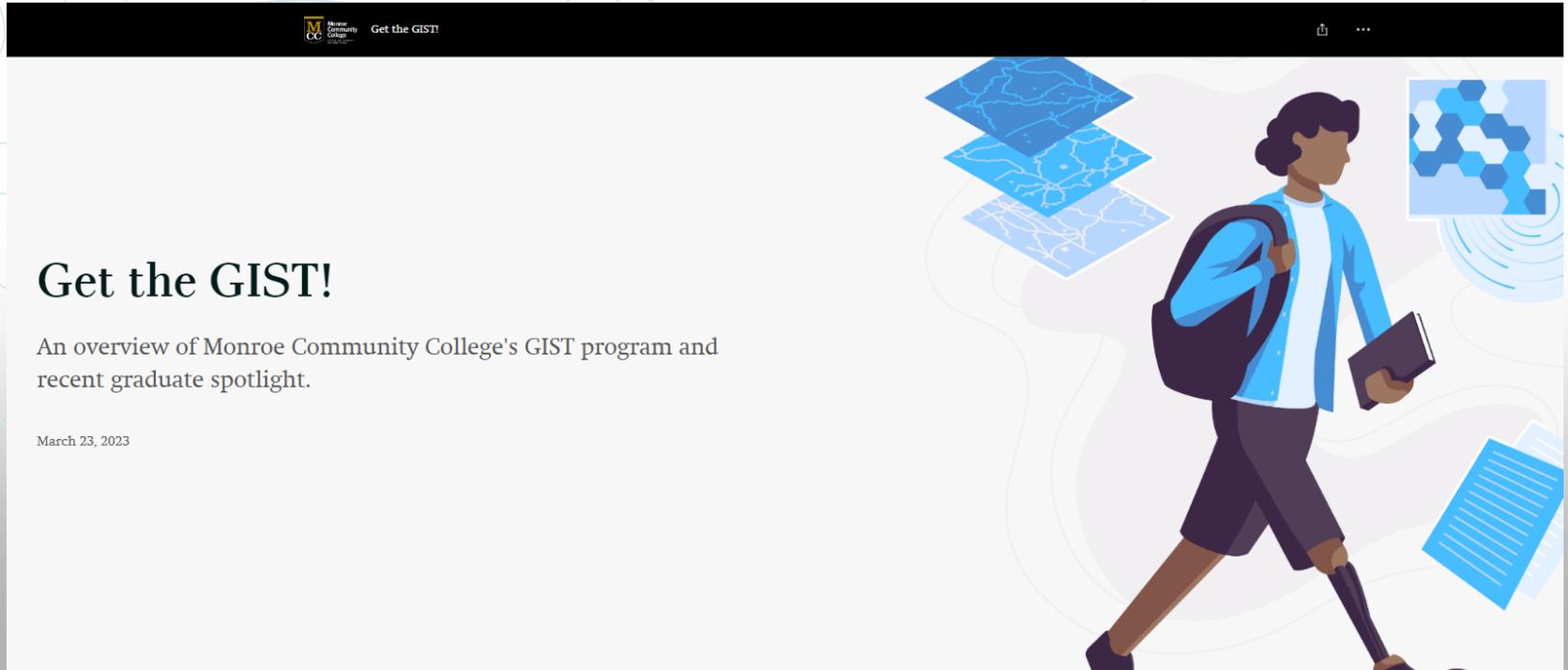




Skills gained through Virtual International Internships

- Provide workforce opportunities
- Remove the barrier of travelling abroad, opening the door to global workforce opportunities.
- Provide underrepresented students the chance to build fundamental global (and domestic) workforce skills
- Develop important business and entrepreneurial skills by providing guidelines for time management, communication, making a connection, expectations, presentation strategies, and overcoming barriers.

Story Map summarizes what I shared



<https://arcg.is/0aCTLT>

We also have U.S. based opportunities for our students...



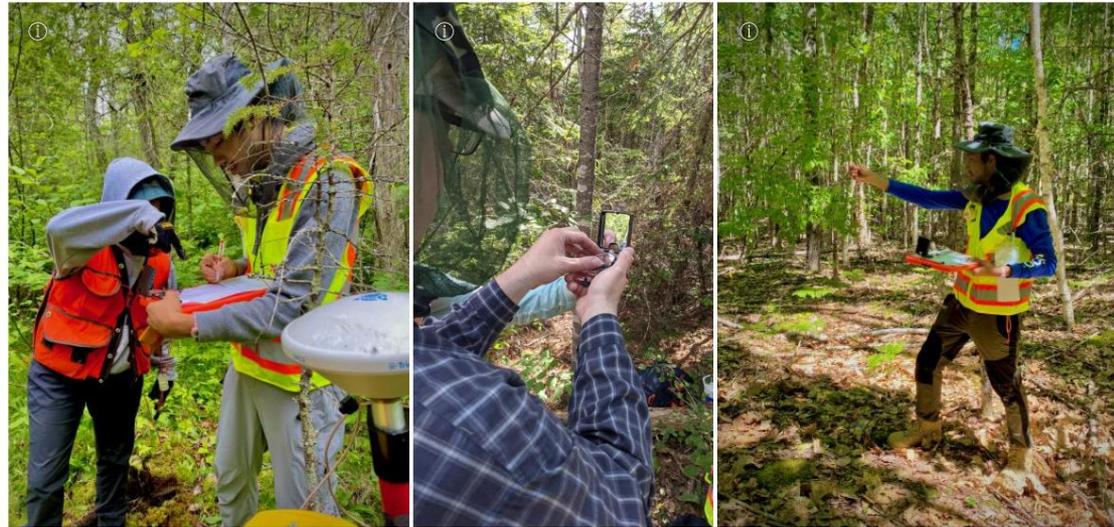
- 2022 Geospatial summer research experience with University of Maine – Center for Advanced Forestry Systems (CAFS)
- Partnered with Dr. Aaron Weiskittel
- ATE Skills Training in Advanced Research & Technology (START) supplement

Funding provided by *Skills Training in Advanced Research & Technology (START) Supplemental Funding Request for ATE at Monroe Community College (Award #1955256) with IUCRC Phase 3 at University of Maine - Center for Advanced Forestry Systems (CAFS)*. PI Name: Jonathon Little State University of New York, Monroe CC and Dr. Aaron Weiskittel, University of Maine and CAFS Director



Objectives

- Provide two 2-year Community College students with a paid 8-week summer internship
 - Collect and process field data for remote sensing applications, particularly tree species composition
 - Present work
- Provide 2 students with a credit-based virtual internship
- Present work



(LEFT): Casmir & Rissa recording data. (CENTER): Wayne calculating azimuth with a compass. (RIGHT): Casmir using a BAF prism to identify variable point samples.

Partners

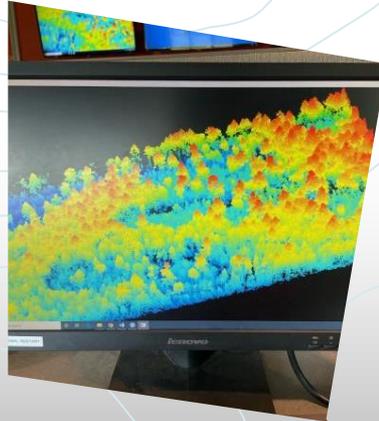
- MCC faculty provide guidance/support
- Students work with CAFS partners in Maine.
 - Barbara Wheatland
Geospatial Lab (Dr. Dan Hayes)
 - Penobscot Experimental Forest
 - Town of Orono
 - University of Maine at Fort Kent (Dr. Ned Rubert-Nason)
 - CAFS (Dr. Pari Rahimzadeh)
 - Schoodic Institute (Dr. Peter Nelson)



Kasey, Casmir, and Bryon working on Round 2 of training samples for cloud masking.

Experience

- Successful experience thanks to Dr. Aaron Wiskettiel and CAFS partners!



Tony giving a presentation on remote sensing and data collection/processing.



Deliverables

- Student Story Map (Week 1-4, 5-8)
- Student Presentations and Poster



Evaluation of Sentinel-2 imagery cloud & shadow masking by a machine-learning algorithm and Fmask post-processing

Casmir Brown
August 4, 2022



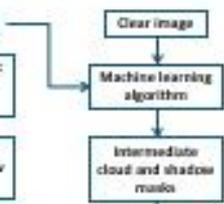
Background

Remote sensing satellite imagery that will be used in the reduction in accuracies and systematic errors. The algorithm developed in 2012 has high accuracy, but not as accurate in forests of Maine.

Methodology

The algorithm to detect cloud and shadow from satellite imagery. One cloud-free (control) and one heavily-shadowed image was acquired from Sentinel-2. Training points are selected via a principal component analysis (PCA) of 300 clusters of similar pixels, from which 1000 points are user-classified in attribute table as cloud/shadow. Points are digitally organized and added to the code for QGIS toolbar.

The classified training points are fed into XGBoost machine learning algorithm to produce intermediate cloud/shadow masks and then compared to the Fmask output. Round 2 training points are selected. Round 2 points are fed into ML algorithm to fine-tune ML output of cloud/shadow masks.



Research Question

If a ML algorithm can be trained to detect and mask cloud/shadow from Sentinel-2 imagery, how will the trained ML algorithm's ability to detect and mask cloud/shadow pixels compare to current standard, Fmask? Is it possible to create a better tool? be available to the public?

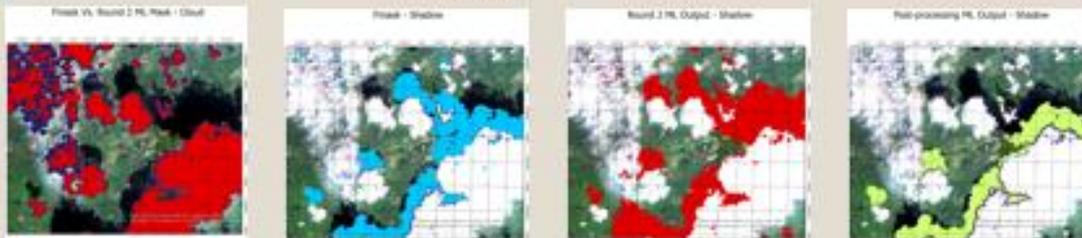


Figure 2. Comparing output for thousands of training for ML algorithm to the current standard, Fmask.

Figure 3. Filling gaps with current standard on shadow masking. Round shadow and masked holes in cloud mask.

Figure 4. 2 rounds of training ML algorithm results in high shadow detection and better, more detailed coverage.

Figure 5. Post-processing results from Round 2 ML output & results return, a more accurate result.

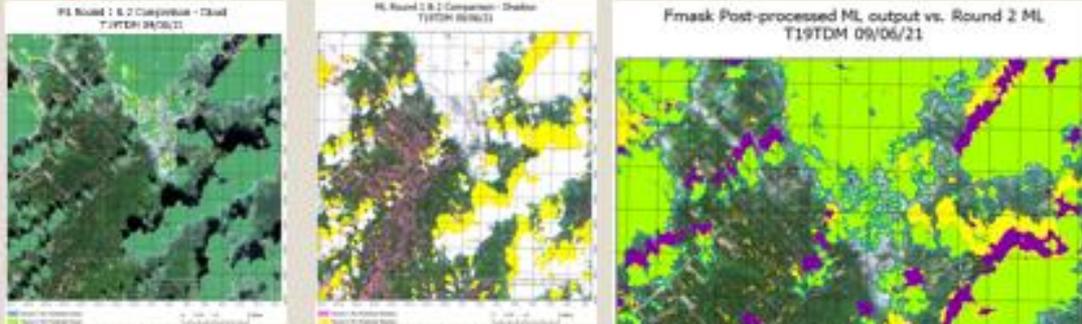


Figure 6. Both rounds of trained ML output show more accurate cloud detection.

Figure 7. Both rounds of trained ML output placed together show increased accuracy of identifying shadow pixels with a second round of training.

Future Work

- Perform accuracy assessment & quantitative comparison on ML output
 - Compare to Fmask accuracy (between 92-4 and 96-4%, dependent on location and source of imagery)
- Evaluation of additional leaf-on imagery
- Further refinement of ML
- More training points for shadow
- Train for cloud/shadow detection on forthcoming imagery
- Software development
 - Expand service to predict all clouds on imagery within Maine
 - QGIS Plugin
 - Continued work with an MCC student intern for a GIGGy Student Capstone Project, Spring 2023

References & Data Sources

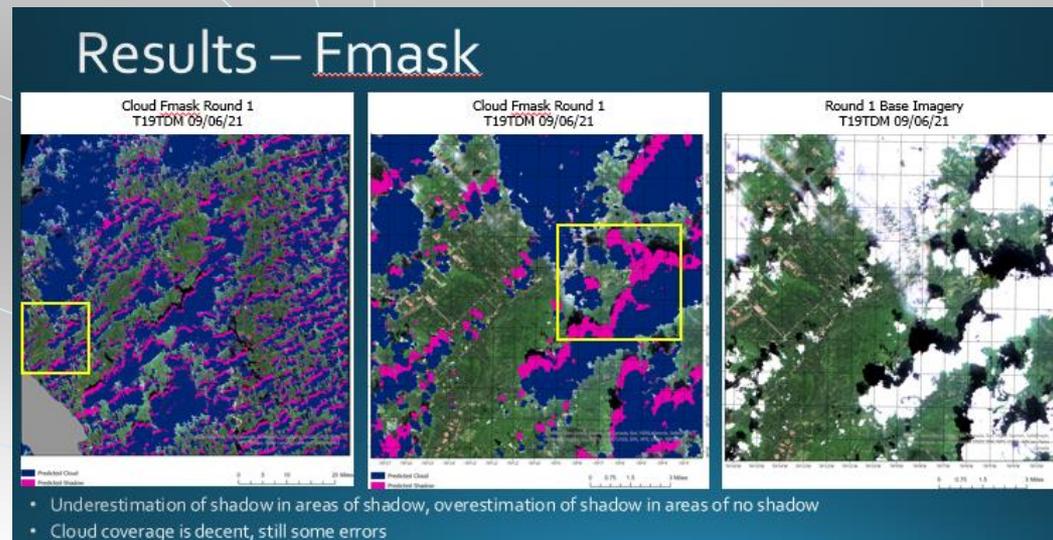
Images acquired from Sentinel-2. All maps are projected in WGS 1984 UTM Zone 18N.

- Zhu, Z., & Woodcock, C. E. (2012). Object-based cloud and cloud shadow detection in Landsat imagery. Remote Sensing of Environment, 118, 83-94. <https://doi.org/10.1016/j.rse.2011.10.010>
- Zhu, Z., Wang, S., & Woodcock, C. E. (2015). Improvement and expansion of the Fmask algorithm: cloud, cloud shadow, and snow detection for Landsats 4-7, 8, and Sentinel 2 images. Remote Sensing of Environment, 159, 208-237. <https://doi.org/10.1016/j.rse.2014.12.010>

Results

Looking Ahead

- New NSF proposal
 - Increase recruitment, retention, and completion of underrepresented students
 - Leverage Maine research experience to increase research opportunities at MCC and other Community Colleges across U.S. If interested, let me know
 - Increase opportunities for virtual workforce based internships and study abroad in Germany



Thank you! Questions?

Jonathon Little: Professor of Geography/GIST and
NSF ATE Principal Investigator;
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Preparing Tomorrow's Workforce

The Global Learning Imperative for Career and Technical
Education Programs at Community and Technical Colleges



Geospatial Interns & GIST Employment

Monroe County



NY State



National and International



Soils, Food and Healthy Communities



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