Virtual Internships
GEG 239: Capstone in GIST

NYS GIS Association, NYGeoCon
September 25-27, 2023
Albany, NY

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.

Welcome and Introductions

Poll question: Have any of you participated in a virtual internship, either as a student or as a host?

Will Simone – Graduate AAS & Micro-credential, May 2023.

Psychology B.A. SUNY Plattsburgh

MCC's GIST Team:

Jonathon Little: Geography/GIST Professor + NSF ATE PI

Heather Pierce: Geography/GIST Professor + Co-PI

Wayne Howard: Adjunct GIST Professor + Senior Collaborator

Catherine DuBreck: MCC GIST + Co-PI

MCC's Geospatial program

- Stackable:
  - 24 Credit GIST Certificate
  - A.A.S. in GIST
  - 9-credit, 3 course micro-credential for GIST professionals
  - All fully accessible on campus and online
- We also have an A.S. Geography concentration in GIST

AAS in Geospatial Information Science & Technology (GIST)

Table 1			
FALL Year 1	**Cr**	**SPRING Year 1**	**Cr**
Introduction to GIST	3	***Web Mapping***	3
Cartography	3	Spatial Analysis	3
English	3	Art/Foreign Language	3
Introduction to Remote Sensing	3	Physical Geography Lab	1
Math	3	Physical Geography	3
		Physical/Health Education	2
FALL Year 2	**Cr**	**SPRING Year 2**	**Cr**
GIS Data Acquisition and Management	3	***Introduction to Programming for GIS***	3
Statistics	3	Capstone Course in Geospatial Technology	2
Elective	3	American History	3
Human Geography	3	Program Elective	3
Elective	3	Elective	3
		Elective	3

Virtual Internships/Partnerships include:

- National GeoTech Center of Excellence
- New York Geographic Alliance
- New York State Department of Environmental Conservation
- NY State Department of State at University of Albany
- GIS Scholars (Inner City Rochester GIS program)
- EagleView
- Freshwater Future – Petoskey Michigan
- FLOW – For the Love of Water – Traverse City Michigan
- Water for South Sudan
- SUNY Cortland
- American Red Cross – Rochester New York
- New York Sea Grant
- Genesee Land Trust
- MCC Library
- River Area Council of Governments (RACOG)
- Washington State DOH
- University of Maine – Center for Advanced Forestry Systems
- Central Library of Rochester and Maine
- Rochester Ecology Partners
- FMCE (Federation of Monroe County Environmentalists)

Global Virtual Internships

- Saving Africa's Nature (SANA) in Tanzania
- Colombia: Fundación Universitaria Tecnológico Comfenalco
- Costa Rica: Monteverdi Institute
- Mexico: Universidad Autónoma de San Luis Potosí
- Kazakhstan: Kazakh State Agrotechnical University
- Malawi: Cornell University and partner in Malawi

Summer paid virtual internships

2021:
Water for South Sudan – Rochester, NY
NYS Department of Health – Albany, NY

2022:
Genesee Land Trust – Rochester, NY
NYS Department of Health – Albany, NY
University of Maine – Advanced Research & Technology (START) – Center for Advanced Forestry Systems (CAFS) project

2023:
University of Maine – Advanced Research & Technology (START) – Center for Advanced Forestry Systems (CAFS) project

The Top 8 Strategies for Cultivating Successful Virtual Internships in GIS

1. Establish a foundation.
2. Develop great relationships with the hosts.
3. Find the right student match for the internship project.
4. Establish ground rules.
5. Have a good game plan and execute it well.
6. Pay attention to the fundamentals.
7. Know when you need to be a cheerleader.
8. Celebrate the results!

Monroe Community College GIST Capstone – 2023 Creating a QGIS Plugin

Student: Will Simone

Internship Host:
Dr. Kasey Legaard
University of Maine

Opportunity made possible 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)*.

Background

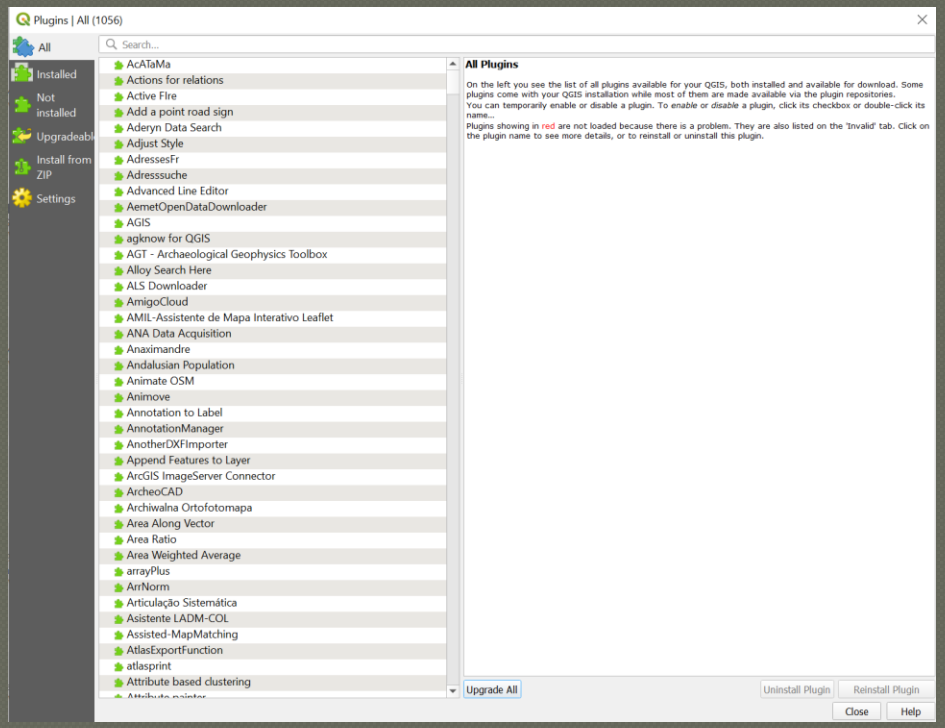
- Analytic experience
- GIS exposure
- Educational options
- MCC GIST
  - Advanced Coursework
  - Capstone NSF Grant Internship

Introduction

- Continuance of existing project
  - Summer Internship 2022
  - Work by fellow student Casmir Brown
  - Positive results needed a way to be implemented
- Dr. Legaard's existing workflow
  - Goals: simplify, improve, accessibility
- Research project

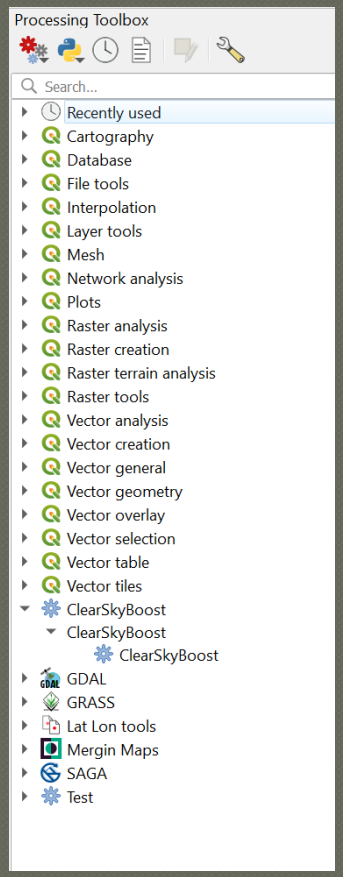
Plugins

- In QGIS, a processing plugin is a script (usually python) or a set of scripts that add extra functionality to the QGIS software.
  - Model builder
  - Arc toolboxes



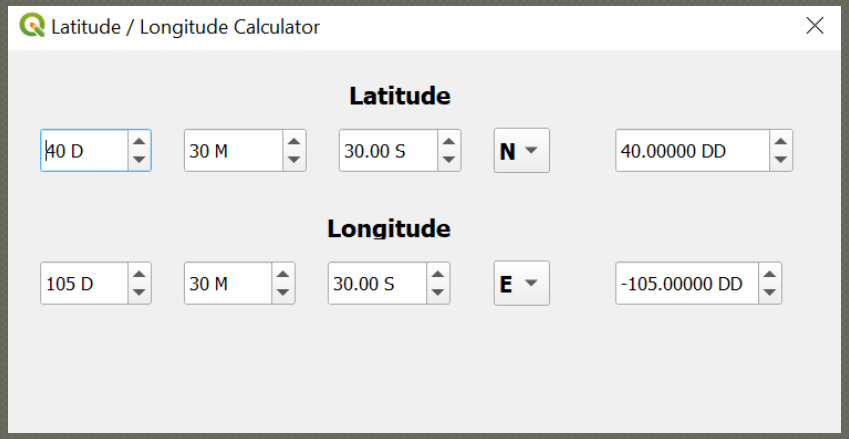
There are several types of plugins in QGIS, including: Processing, Map Layer, GUI, Action

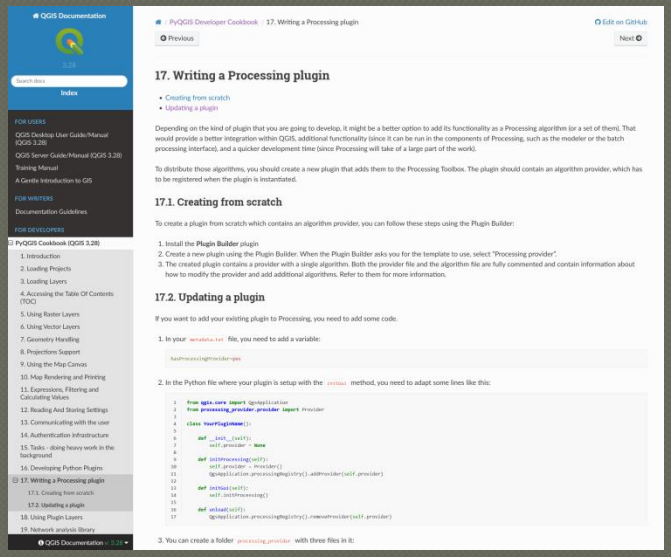
1056 Officially published on QGIS

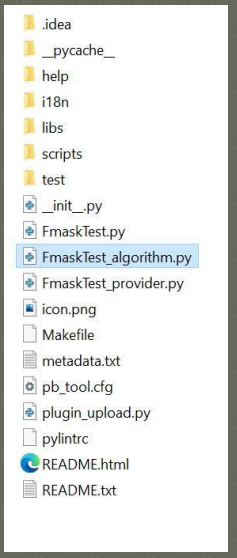


Development

- Getting Started
  - Self directed learning
  - UDEMY Course
  - Practice plugin
- Under the Hood
  - QGIS processing parameters
  - Fmask and its dependencies



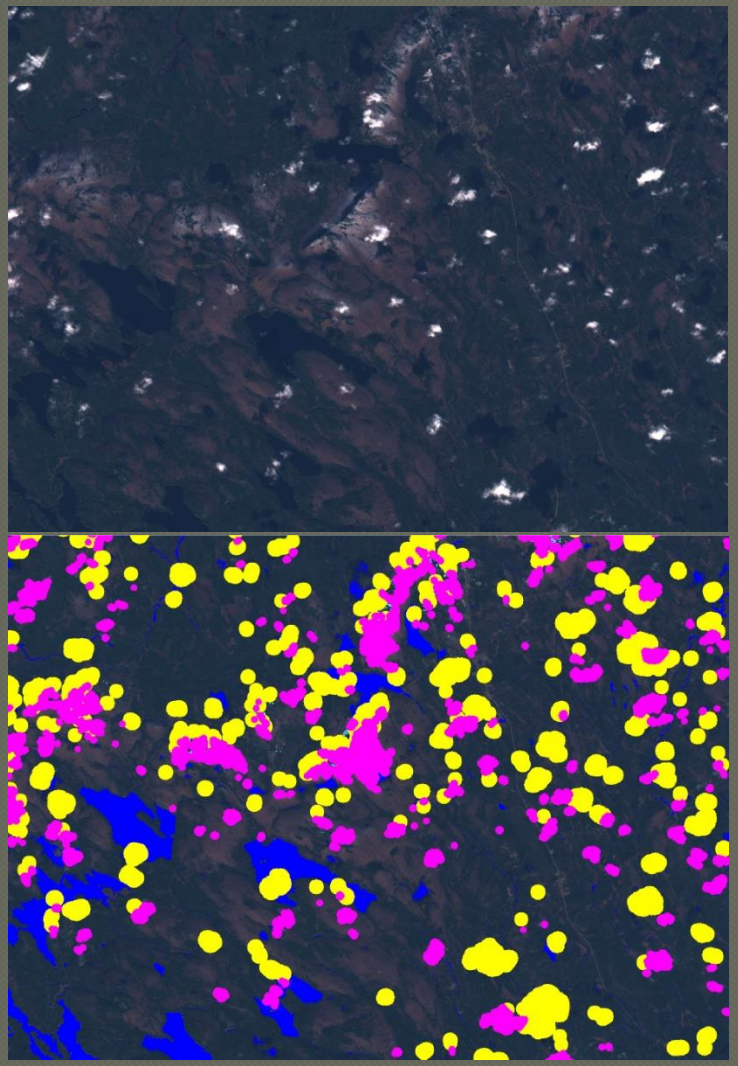




Modifying FMask

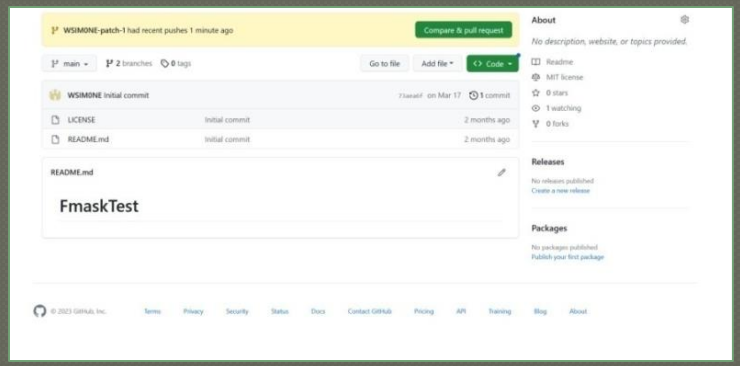
- Parameter inputs
  - CMD Line vs GUI
  - Reduce errors
  - Harnessing existing parameters

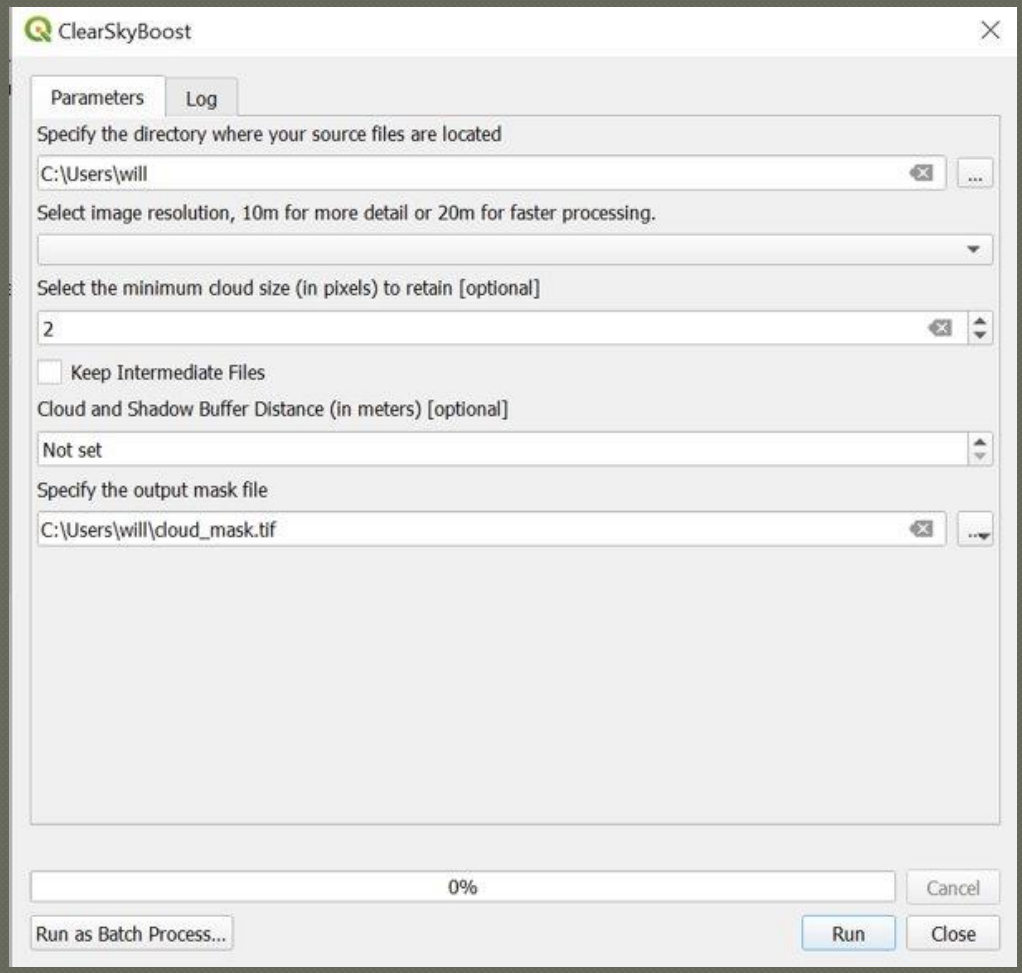
```
class FmaskTest_Algorithm(QgsProcessingAlgorithm):
    SAFE_DIR='SAFE Directory'
    OUTPUT_PATH="Output Mask Path"
    RESOLUTION = 'RESOLUTION'

    def initAlgorithm(self, config=None):
        self.addParameter(QgsProcessingParameterFile(
                self.SAFE_DIR,
                'Specify the directory where your source files are located',
                defaultValue=os.path.expanduser('~'),
                behavior=QgsProcessingParameterFile.Folder
                ))


        self.addParameter(QgsProcessingParameterFileDestination(
                self.OUTPUT_PATH,
                'Specify the output mask file',
                createByDefault=True,
                defaultValue=os.path.join(os.path.expanduser('~'), 'cloud_mask.tif'
                fileFilter='GeoTIFF (*.tif)'
                ))  ##Updated 3/30

        self.addParameter(QgsProcessingParameterEnum(
        self.RESOLUTION,
        'Select 10m or 20m resolution. Higher resolution may take longer to process
        options=['10','20'],
        defaultValue= '20'
        ))
```



Results

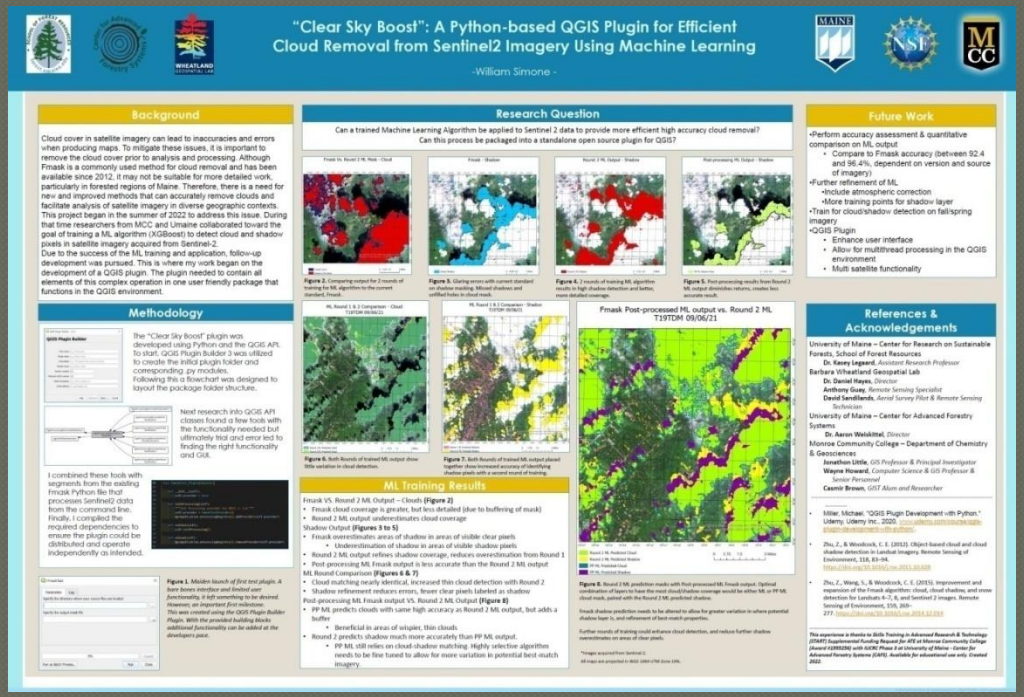
- Current state of the plugin
  - Bug tracker
  - GUI
  - Self correcting parameters
  - Processing status





Extended Development

- Additional Opportunities
  - Summer 2023 Internship
  - SUNY Undergraduate Research Conference



- Data standardization
- ML Algorithm
- Expand parameters
- More Processing Cores
- Publish

Acknowledgements

- University of Maine – Center for Research on Sustainable Forests, School of Forest Resources
  - **Dr. Kasey Legaard**, *Assistant Research Professor*
- Barbara Wheatland Geospatial Lab
  - **Dr. Daniel Hayes**, *Director*
  - **Anthony Guay**, *Remote Sensing Specialist*
  - **David Sandilands**, *Aerial Survey Pilot & Remote Sensing Technician*
- University of Maine – Center for Advanced Forestry Systems
  - **Dr. Aaron Weiskittel**, *Director*
- Monroe Community College – Department of Chemistry & Geosciences
  - **Jonathon Little**, *GIS Professor & Principal Investigator*
  - **Wayne Howard**, *Computer Science & GIS Professor & Senior Personnel*
  - **Casmir Brown**, *Student Intern*

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Questions and Comments?

Email:
Wayne Howard
whoward11@monroecc.edu

Jonathon Little
jlittle@monroecc.edu

Thank you!

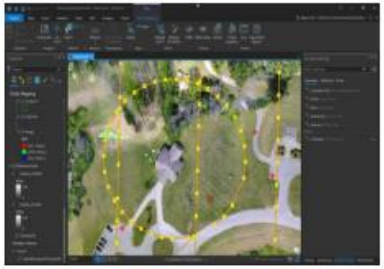
Every Fall

Geospatial Data Acquisition and Management

GEG 236 (3 credit hours) - Part of the micro-credential series (GEG 236, 237, 238), the A.A.S. in GIST and as an elective in the GIST Certificate program.

This course addresses the interpretation and understanding of a variety of data formats used by geospatial professionals. It introduces the fundamental concepts such as primary Geospatial Information Science (GIS) data creation, geodatabase design and creation, data management, and discusses quantitative techniques for the collection, classification, integration, and management of geographical data. Advanced topics include: UAS data collection and processing, mobile data collection, automation using Python and enterprise geodatabases. Students will be guided through a series of lectures hands-on computer-based exercises, and an end of semester project.

Prerequisites: Introduction to Remote Sensing (GEG 133) or permission of the instructor.



Students in this course:

- Learn important geospatial data management skills that are in high demand!
- Learn the fundamentals of UAS (drone) training, safety, mission and flight planning.
- Develop skills in UAS data collection and processing.
- Learn advanced skills in mobile data collection.
- Interact in a multi-user environment using postGIS.

Topics covered:

- Data models, data formats and data management
- Best practices for data collection and processing
- Database management systems and schema
- Advanced geodatabase design
- Topology
- Enterprise geodatabase design
- Using QGIS in a multiuser, postGIS environment
- Introduction to Python automation

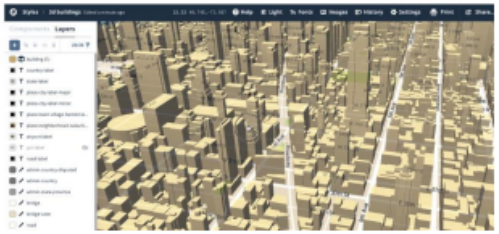
Every Spring

Web Mapping

GEG 237 (3 credit hours) Part of the new micro-credential series (236, 237, 238)

This course is an introduction to Web-based GIS. Students will learn about the usefulness and application of Web GIS tools such as ArcGIS Online Story Maps, Esri Dashboard, Esri Insights, Volunteered Geographic Information (Open Street Map), and Map services (Mapbox or GISCloud). Students will become adept at storing and accessing spatial data in the cloud, practice developing Story Maps to communicate spatial data, and learn how web mapping is key to mobile GIS applications such as field data collection (Esri Field Maps). Students will be guided through a series of lectures and hands-on computer-based lab exercises. An end of a semester project will allow students to work on a project of their own design. Course material used are based upon the United States Department of Labor's Geospatial Technology Competency Model (GCTM) for entry level geospatial occupations including Geospatial or GIS Technicians or Technologists.

Prerequisites: Digital Earth (GEG 130) or permission of the instructor.



Students in this course:

- Learn important geospatial web mapping skills that are in high demand!
- Apply web GIS tools such as ArcGIS Story Maps, Open Street Maps, and MapBox.
- Develop field data collection apps.
- Apply cartographic principles in online map design.
- Practice using web maps as a tool for topics such as emergency management.

Topics covered:

- Web Mapping vs. Desktop
- Spatial Data in the cloud
- Web GIS platforms
- Online map publication on a web service
- Story Map Design
- Apply critical-thinking skills to solve problems by using Web GIS tools in the development, management, completion, and evaluation of a comprehensive geospatial project.

SPRING 2022

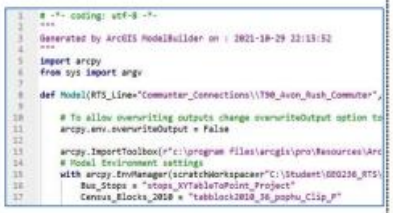
Introduction to Geospatial Programming

GEG 238 (3 credit hours)

Part of the micro-credential series (GEG 236, 237, 238) and the A.A.S. in GIST.

This course teaches how to customize and automate Geospatial Information Science (GIS) applications using the Python scripting language. Automation can make your work easier, faster, and more accurate, and knowledge of a scripting language is a highly desired skill in GIS analysis. Upon completion, students will be able to solve geospatial problems and streamline GIS workflows through the creation and modification of scripts. Students will be guided through a series of lectures and hands-on computer-based lab exercises. Course material used are based upon the United States Department of Labor's Geospatial Technology Competency Model (GCTM) for entry level geospatial occupations including Geospatial or GIS Technicians or Technologists.

Prerequisites: GEG 130, GEG 133, and GEG 230 or GEG 236 all with a grade of C or higher or permission of the instructor.



Students in this course:

- Learn to automate geoprocessing tools and to modify and create scripts in Python.
- Learn geospatial coding best practices.
- Design and develop custom GIS applications.
- Modify user interfaces to increase productivity.
- Understand introductory programming concepts, methods, approaches and workflows.
- Explain advanced programming concepts.

Topics covered:

- Introduction to Python and geoprocessing tools.
- Model Builder and programming fundamentals.
- Geoprocessing and object-oriented programming.
- GIS inventory using the data access module.
- Debugging and error handling.
- Data access and creation with geodatabases.
- Working with geometry and map layout.
- Jupyter notebooks.