

Advanced GIS: Geospatial Data Wrangling(with Python)

Geog 4/591 - Fall 2020

Lecture - 12:30-1:20 Tuesday and Thursday - “The Early Afternoon Show”

Lab - 10:15-11:45 or 12:15-1:45 Wednesdays - live online support and discussion

Instructor: Dr. Nicholas Kohler (nicholas@uoregon.edu)

Office Hours: Wednesdays 11 to 11:50am and 1:30 to 2:45pm

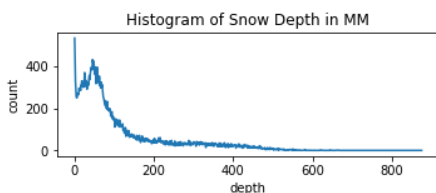
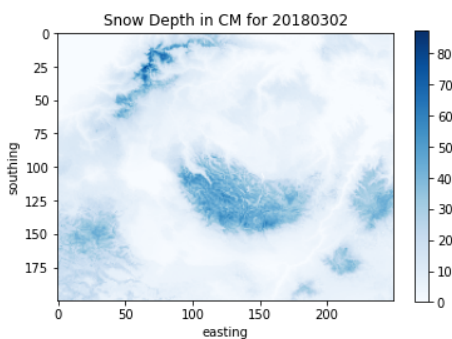
- Sign up for individual 15 minute time slots via ‘[Slottr](#)’
- If meeting times are full, or these weekly time periods do not work for you, please email Nick for a different appointment time.

GE/Lab Instructor: Schyler Reis (schylerr@uoregon.edu)

Office Hours: Tuesday 3-4 and Friday 3-4pm. Please email Schyler in advance!

Prerequisites: Geog 481 or Instructor’s Consent. *No prior programming experience is required.*

```
In [8]: ### now make a function to open the snowdepth for the date, filter no data values, a  
### draws a plot of the snow depth, and a histogram of depth values  
def readsnow(dat_date):  
    newtif = gdal.Open('us_ssmv11034tS__T0001TTNATS{}05HP001.tif'.format(dat_date))  
    print('us_ssmv11034tS__T0001TTNATS{}05HP001.tif'.format(dat_date))  
  
    tifArray = newtif.ReadAsArray()  
    newMasked = np.ma.masked_where(tifArray == -9999, tifArray)
```



Course Description

This class introduces students to automated geospatial data collection, analysis, and visualization. Exploring concepts underlying spatial data management, processing, and visualization using the open-source “Python” scripting language, students are encouraged to become comfortable with basic concepts of geospatial data management and the automation of spatial analysis

Scripting languages and graphic modeling provide a means to efficiently collect and process geographic information, and are crucial tools for scientists and businesses that use geospatial data. Course materials and class work focuses on the application of both

proprietary and open-source tools for research and production purposes.

Perhaps most important, the class is designed to foster the ability to continually learn in an online and collaborative environment, developing skills in the rapidly growing applications of geospatial data science.

Learning Outcomes

The coursework should make students comfortable with geospatial data management, visualization, and processing, and confident in their ability to automate spatial analysis workflows.

In the class students will:

- Identify and manage appropriate data models to represent spatial features
- Analyse and visualize geospatial information
- gain experience writing Python scripts to download, create, interact with and analyse geospatial data in ArcGIS and other software packages;
- understand the basic concepts behind object-oriented scripting and computing languages; and
- be able to create graphic models and custom tools for spatial analysis projects.

Course lectures and discussions cover the basic concepts behind modern scripting languages such as Python (and R), introduce students to the paradigms of open-source software and reproducible science, and delve into the concepts underlying spatial data science. In class labs, students will gain hands-on familiarity with using Python to automate geospatial analysis tasks, using tools such as Arcpy, Geopandas, Numpy, and Matplotlib to process and visualize geospatial data.

Readings:

- *Online readings* linked in this syllabus, on [Canvas](#), or in lecture notes and labs.
- *Python Scripting for ArcGIS Pro*, 2020. Paul A. Zandbergen
Print ISBN: 9781589484993, 1589484991
eText ISBN: 9781589485006, 1589485009
<https://www.vitalsource.com/referral?term=9781589485006>

Suggested Readings and materials:

Introductory programming with Python -

[The Python Tutorial](#) (3) ; [Python for non-programmers](#) ; [How to Think Like a Computer Scientist](#)

GIS Programming and Automation Class - PSU

<https://www.e-education.psu.edu/geog485/node/91>

EU Python Course

<https://www.python-course.eu/course.php>

[ESRI Python Introduction Online Class](#)

[CodeAcademy Python Courses](#)

Course Policies

- **Communicating with the Instructor and Graduate Teaching Assistant**

Most lecture and lab sessions are 'live' zoom meetings, and are the primary means of interacting with the instructors and your fellow students. Weekly assignments will be discussed during lecture sessions, and are generally due within a week after they are assigned. Recorded lecture sessions will be posted to canvas. Email is the easiest way to contact instructors, and during the week you should have a response within one day - generally much sooner. Meeting times with Nick can be scheduled in 15 minute time slots weekly via '[Slottr](#)'

Please contact the instructors with questions about the materials and labs, suggestions for the class, and about any other issues related to the class. If you have questions about lab work, it is often good to include a screenshot of the problem and to give the file location of your work on the R: drive.

- **Technical Requirements**

An internet connection and a basic computer with web capabilities are the main technical requirements for the class. Course materials and collaboration with instructors and other students will occur via Canvas and using the associated Zoom virtual meeting accounts. Lab work will require some sophisticated software, but this is available to students via the UO Virtual "[High Performance Lab](#)"

- **Participation**

Participation is expected during scheduled lecture and lab times, and for group projects and exercises outside of scheduled hours. Please let the instructors know if you have difficulties in attending during these times, or need to make up for missed participation - accommodations can usually be made.

- **Student and Instructor Mental Health**

Usually, it is easier and more fun to learn when things are calm and going well. Sometimes things are not calm or well, and obstacles to participation in the class arise. This is fine, and problems with the class can be taken care of if they are discussed. Please feel free to ask for additional time on assignments, to contact the instructors about seeking additional help on assignments, or just to reach out for some random chit-chat. The UO offers a variety of services to assist with mental health support ([linked here](#)).

- **Academic Integrity**

Academic integrity is important both for your own learning and for the value of the

degree you will get from the University of Oregon. You are expected to:

- Submit your own work for assignments, labs, and tests, expect for group assignments
- Not share your solutions to work in the class (except for portfolio and CV purposes)
- Not engage in other activities that dishonestly change my grade or other students grades.

Academic misconduct will be reported to the Office of Student Conduct and Community Standards, and result in a loss of points for the assignment. Please be clear when you are working with another student to avoid any problems.

Grading

Geog 461 requirements:

- 45% Individual Labs and Projects
- 50% Online Exams and Weekly Lecture Assignments (Both individual and group work)
- 5% Final Project (script or analysis model) and Presentation

Geog 561 requirements:

- 40% Individual and Group Labs and Projects
- 45% Exams and Lecture Assignments (Take Home or In-Class),
- 10% Final Project (includes proposal, annotated bibliography or write-up, python script, and Presentation)
- 5% Automation/analysis methods presentation sometime during the term, accompanying write-up or annotated bibliography and slides.

Work load distribution over the term

Online Lectures/Presentations/Discussions:	20 hours (20 x 1 hour meetings)
Lecture and discussion assignments:	25 hours (average)
Readings, audio, and video:	25 hours (@ 2.5 hours per week, average)
Lab work - live online support:	20 hours (@ 2 hours per week)
Lab work - unsupervised:	30 hours (@ 3 hours per week)

Total 120 hours

* Graduate Students additional 40 hours on individual projects and presentations

Late work policy

- Lecture and lab assignments: 10% off maximum grade per full day late, 50% off maximum grade after 5 days.