Special Topics in Python for Geosciences
3 credits

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Description:

This course offers an

Learning outcomes:

Students will compile and run parallel codes for use on distributed memory supercomuters, use batch
scheduling of computer programs, and identify and fix problems in standard supercomputer management
software. Students will create programs that use multiple processors using the Message Passing
Interface. Students will analyze large data sets. Students will collaborate on a class project using
standard tools such as Version Control Systems for maintaining collaborative software projects. Students
will create scripts in the Python programming language to solve research problems.

Course Outline:

Week 1-2: Core language
Overview of the standard python programming language, standard data containers (lists, tuples, dictionaries, etc),
importing packages, for/while loops, and functions.

Week 3-4: Numerical python
Using numpy and scipy, vector operations, and best practices for large numerical datasets.

Week 5: Basic plotting in python
Overview of the matplotlib plotting package.

Week 6-7: Plotting on the earth
The Basemap package, the proj3 library, and other geospatial applications.

Week 8: NetCDF
Reading and writing NetCDF files locally and over the internet.

Week 9-10: Object Oriented programming and data structures
Object oriented programing (OOP) techniques, and good programming practices. OOP as a surrogate for data
structures.

Week 11: Wrapping FORTRAN code
Wrapping FORTRAN code using f2py, and other numerical performance code techniques.
Week 12: Creating and distributing large projects

How to create and distribute a large python package using standard techniques, like distutils and github.

Week 13-14: Group project presentations.

Prerequisites:
None, however, basic understanding of some programming language is strongly recommended.

Grading:
Homework will be assigned approximately every other week. Students will be expected to bring unique problems to the class, so that the homework can involve real applications. There will be no exams. There will be a final project. Homework will account for 50% of the grade, class participation 25%, and the final project 25%. The grading scale is 90-100% = A, 80-89% = B, 70-79% = C, etc.

Text:
There will be no text for this class. Online resources will be sufficient.

Plagiarism. As commonly defined, plagiarism consists of passing off as one's own the ideas, words, writings, etc., which belong to another. In accordance with this definition, you are committing plagiarism if you copy the work of another person and turn it in as your own, even if you should have the permission of that person. Plagiarism is one of the worst academic sins, for the plagiarist destroys the trust among colleagues without which research cannot be safely communicated. If you have any questions regarding plagiarism, please consult the latest issue of the Texas A&M University Students Rules, student-rules.tamu.edu, under the section ‘Scholastic Dishonesty.’

ADA statement. The Americans with Disabilities Act (ADA) is a federal anti-discrimination statue that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring accommodation, please contact the Department of Student Life, Services for Students with Disabilities in Room 126 of the Koldus Building. The phone number is 845-1637.