Special Topics in Python for Geosciences
3 credits

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Description:
This course provides an introduction to data analysis and graphical representation of oceanographic data using the Python programming language. Topics include how to read and write data using standard formats; modern programming techniques including object oriented programming, version control systems, and the model-view-controller paradigm; plotting geophysical data using various projections, best practices in plotting, and interactive plotting.

Prerequisites: Graduate: None; Undergraduate: U3 or U4 status.

Learning outcomes:

Course Outline:

Week 1-2: Python basics — Core language
Using the terminal window, iPython, and Jupyter notebooks. Using version control and using git and github to manage code (and submit homework). Overview of the standard python programming language, standard data containers (lists, tuples, dictionaries, etc), importing packages, for/while loops, functions, and object oriented programming.

Week 3: Numerical python
Numpy and scipy packages, vector operations, data types, and array broadcasting.

Week 4: Basic plotting in python with matplotlib
Overview of the matplotlib plotting package, plot attributes.

Week 5-6: 2D analysis and geospatial plotting
Basemap package, map projections using the proj3 library, gridding irregular data, and calculating attributes of polygons using shapely.

Week 7-8: 1D time series analysis
numpy.datetime, pandas, indexing, averaging, and spectra.

Week 9: NetCDF
Reading and writing NetCDF files locally and over the internet.

Week 10-11: Scikit learn regression and characterization
Creating linear models using regression, classification using characterization.

Week 12: Examples

Week 13-14: Group project presentations.

Prerequisites:

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

Grading:

Homework will be assigned approximately every week; there will be no exams.
Undergraduate grading: Homework will account for 75% of the grade, class participation 25%. Undergraduate students are welcome to participate in the group projects, but it is not required.
Graduate grading: Graduate students will be expected to also work on a group project, with results presented in class in the final weeks of the course, and code distributed publicly; homework will account for 50% of the grade, class participation 25%, and the group project 25%.
The grading scale for all students is 90-100% = A, 80-89% = B, 70-79% = C, etc.

Text:

There is no required text for this class.

Attendances:

Excused absences will be based on Student Rule 7 (http://student-rules.tamu.edu/rule07). Please inform me before any planned absences, and I will try to be accommodating.

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