MARS 8130 Seminar in Hydrobiology – Spring 2019

Process modeling and data analysis in aquatic sciences

Meeting time: Mon 9.05-9.55, Room 239 Marine Sciences Bldg.

Overview: The purpose of this class is to provide an overview of a range of modeling and data analysis approaches in the geosciences. Topics will include simple box models based on conservation equations, as the foundation for process-based reactive transport models. Complementary to such (semi-)mechanistic approaches, we will discuss data-driven methods of dimensionality reduction and time-series analysis, and possibly machine learning. Students will be encouraged to share their scientific problems and lead & benefit from discussions on modeling approaches related to their area of interest. Some lectures will feature guest speakers presenting the fundamentals and applications of particular methods in their research.

Credit: 1 credit for participation in the course. Earning more credits (up to 3) is possible through project work. Please contact the instructor directly to discuss possibilities, best prior to the beginning of the course.

Grading: pass/fail. Based on participation in class, contribution to paper discussions and reading assignments, etc.

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Lecture outline

Jan 14 –	Introduction, discussion of background and learning goals
Jan 21 –	MLK day, no class
Jan 28 –	Box models; response to perturbations
Feb 4 –	The advection-diffusion equation: derivation, approximations
Feb 11 –	Reactive transport: Process selection, individual working examples
Feb 18 –	Numerical implementation
Feb 25 –	RTM paper discussion
Mar 4 –	Upscaling and Lattice–Boltzmann
Mar 11 –	Spring break, no class
Mar 18 –	Data integration: Optimization of parameters
Mar 25 –	Data integration: Data assimilation
April 1 –	Data reduction: Statistics & Principle component analysis
April 8 –	Data reduction: Empirical orthogonal functions
April 15 –	Time series analysis: FFT
April 22 –	Time series analysis: Empirical mode decomposition, Wavelets
April 29 –	Machine Learning: Neural networks

May 8, 8-11am (final exams): (group) discussion/presentation

Jan 9-15: drop/add
Mar 21: withdrawal deadline

General statements:

Academic Honesty: As a University of Georgia student, you have agreed to abide by the University's academic honesty policy, "A Culture of Honesty," and the Student Honor Code. All academic work must meet the standards described in "A Culture of Honesty" found at: https://ovpi.uga.edu/academic-honesty/academic-honesty-policy. Lack of knowledge of the academic honesty policy is not a reasonable explanation for a violation. Questions related to course assignments and the academic honesty policy should be directed to the instructor.

Plagiarism ("to take ideas, writings, etc. from another and pass them off as one's own", Webster's New World Dictionary) will not be tolerated. There are several forms of plagiarism, ranging from outsourcing your work to somebody else, to slight rewording of a published text or summarizing a text without citing it. If you are in doubt consult with the instructor *before* you hand something in.

Changes to the Course Syllabus: The course syllabus is a general plan for the course; deviations announced to the class by the instructor may be necessary. Failure to regularly attend class may result in your being uninformed about changes in the course content or timing of assignments. Students who miss class are responsible for all announcements and assignments given in lecture.

Access Statement: The University of Georgia is committed to providing access for all people with disabilities and will provide accommodations if notified prior to the start of the semester. Please contact the Disability Resource Center if you will need a sign language interpreter, assisted listening device, or other classroom accommodations. If you would like to discuss classroom and/or testing accommodations, please discuss your needs with the instructors of record as soon as possible.

Resources for Student-Parents: If you or someone you know is in a phase of life that involves parenting (or the expectation of parenting), there are resources available to assist you. Student Care and Outreach within the Office of the Dean of Students is available to you and can provide you with important information and resources; you can contact them at 706-542-7774. Additionally, the student group UP at UGA works to provide peer support and resources to students who are pregnant or parenting; you can find out more about their work at http://www.upatuga.org/, or contact them directly at upliftingparents.uga@gmail.com.