BCHS4397 : Special Topics: A Primer in computational medicine
Cr. 3. (3-0). Prerequisites: Consent of instructor

Fall 2014
Class Time: Tuesday-Thursday; 8:30-10:00 am
Class Location: MH113

Instructor: Dr. Marc Garbey
Office hours: by appointment
Office: PGH 210

We will assume that the students attending these lectures have a general interest in medicine and would like to learn about quantitative analytical methods. Upon completion of this course, students will be able to:

1. Understand basic algorithms to tackle a broad variety of problems in medical science.
2. Use Matlab tools or equivalent for these problems.
3. Apply rigorous procedure to test the quality of the solution.
4. Test some hypothesis using model and numerical experiments.

- Most of the lectures will be based on practical examples.
- No text book required, but you may consult the bibliography provided below.
- Most of the material will be provided by the instructor.
- While the program of the course is ambitious, we will assume a minimum of knowledge in math and programming. In particular, we will favor learning by building simple “experimental set up” with the computers.

Grading will be based on:
Three Quizzes: 20 %
Three assignments: 30 %
Active Participation to the Class: 20 %
Final Project Exam: 30 %

This course builds upon our experience in computational surgery -
http://www.computationalsurgery.org:
“As the digital revolution transforms the working environment of the surgeon, close collaboration between surgeons and computational scientists is not only unavoidable but essential to harness the capabilities of both fields to optimize the surgical care. We believe that this new collaboration will allow the community to develop not only predictive models for the outcomes of surgery, but also to enhance the process of surgery - from procedural planning, to execution of procedures and technology...
interfaces, to assessment of the healing process – investigations that will potentially provide great impact on patient care that far beyond the operating room. A fundamental knowledge of biology guides advances in the field and further advances in surgery will not be reduced to improved manipulations and technologies. Indeed the unique genetic and biological platform of individual patients will frame the surgical interventions in the future.”

Some of the topics discussed in this course:

(1) Week 1: Introduction/motivation, two examples from today medical clinical practice from cardiovascular and cancer studies.
(5) Week 7: Tumor growth modeling.
(6) Week 8: Basic principle of healing model.
(8) Week 10: Feedback mechanism between environment condition and tissue adaptation.

This class will use extensively the “language” of differential equations and cellular automata.

Home work is due every last Tuesday of each month starting in September. Each student will be given a personal project: the last two weeks of the class will be devoted to project presentation and counted as the final exam. A short written exam will be given every last Thursday of each month starting in September.

Bibliography


Students with Special Needs: The Americans with Disabilities Act of 1990 requires that universities make reasonable accommodations to persons with disabilities as defined in the act. Students who feel they need assistance as defined by the guidelines set forth in the act should contact the lab coordinator, Dr. Garbey, to discuss appropriate arrangements.

Incomplete Grade Policy: A temporary grade of “I” can be assigned by the instructor when a student is currently (a) passing a course or (b) still has a reasonable chance of passing in the judgment of the instructor, but for non-academic reasons beyond their control have not completed a relatively small part of all course requirements. After the student and the instructor agree that the student shall receive an “I” grade, an “Incomplete Grade Agreement” form must be completed and filed with the Office of Undergraduate Affairs (124F, Science Building). Further information on “I” grades can be found at http://catalog.uh.edu/content.php?catoid=6&navoid=1077.

Administrative Reminders:
Last day to drop without a grade: Wednesday, September 10th.
Last day to drop with a W: Friday, October 31st.

Please note: I do not drop students from the course. If you fail to show up to class and do not drop yourself from the course, a grade of F will appear on your transcript and will not be changed retroactively.