UCONN | THE GRADUATE SCHOOL

Syllabus

Course number, title and other information: MEDS6498; Topics in Bioinformatics and Computational Biology, 3 credits; fall 2017.

Course Director(s) information:
Reinhard Laubenbacher, Ph.D., Center for Quantitative Medicine, 195 Farmington Ave., laubenbacher@uchc.edu, 860.436.7516.
Krish Karuturi, Ph.D., Jackson Laboratory for Genomic Medicine, krish.karuturi@jax.org.

The course will meet on Mondays, 2-5pm, in **Classroom A8 in the Academic Building** (outside the Rotunda). The course will begin on 8/28/17 and end on 12/11/17.

Prerequisites: Introductory courses in or some familiarity with bioinformatics, concepts related to probability and statistics, and basic concepts in machine learning. Experience with bioinformatics tools in genomics will be useful.

Course description and objectives: The focus of the course is on the study of cutting edge computational problems related to the study and treatment of diseases, and discussion of relevant technologies. The course provides a practical introduction to current bioinformatics and computational biology topics of interest in cancer biology, immunology, microbiome and statistical genetics research, along with genomics, systems biology, single cell technologies, and cloud-based computing. The course will prepare participants for further in-depth study of these topics. Brief description of course and learning objectives

Course format. The course consists of lectures and discussion on 7 topics. Each topic will be introduced by scientists working in the respective area, followed by hands-on-assignments and topical presentations. In addition, material for reading and resources will be provided on significance assessment, clinical genomics, and ethics in genomic science. In addition, students will be expected to do a mini-project relevant to the course.

Course materials: Hand-outs, slides.

Exam, quiz schedule and policy: No exams or quizzes

Homework policy: Homework assignments are due as stated. No acceptance of late assignments

Grading rubric: Assignments and presentations 30%; final project 30%; class participation 40%

Other expectations: None

Schedule of Sessions:

1. Genome Analytics (2-3 hr-sessions): 08/28 (*Anuj Srivastava*) & 09/11 (*Mohan Bolisetty)*
    a. Advances in Genomic Technologies, Analytics & Resources
    b. Single Cell Genomics & Resources

    No class on 09/04 (Labor Day)

2. Cancer Informatics (2-3 hr-sessions): 09/18 (*Jeff Chuang)* & 09/25 *(Joshy George)*
    a. Overview of Cancer Biology
    b. Cancer Evolution & Heterogeneity
    c. Subtyping, Tumor Classification and biomarkers
    d. Resources (Tools, Data & Websites)
3. Microbiome & Metabolomics (2-3hr-sessions): 10/02 *(Preeti Bais)* & 10/09 (*Mark Adams)*
    a. Overview
    b. Analytics
    c. Resources (Tools, Data & Websites)
4. Statistical Genetics (2-3hr-sessions): 10/16 (*Guru Ananda)* & 10/23 *(Don Lee)*
    a. GWAS
    b. Imputation
    c. Evolutionary principles in Statistical Genetics
5. Systems Biology (1-3hr-session): 10/30 (Pedro Mendes)

    No class on 11/06 (MD/PhD LEAP exam)

6. Network Biology (1-3hr-session): 11/13 (Paola Vera-Licona)
7. Bioinformatics on Cloud (1 3hr-session): 11/20 – *TBD*
    a. Introduction to Cloud computing
    b. Analytics on Cloud
    c. Resources on cloud
8. Selected topics (2 3hr-sessions, 11/27)
9. Project presentations (2 3hr-sessions, 12/4 and 12/11)

Topics for further reading:

1. Significance Assessment in Bioinformatics: Issues and Methods – Krish *Karuturi*
2. Clinical Genome Informatics – *Guru A*
    a. Clinical Genomics for Personalized Medicine
    b. Designing Genomic Diagnostics
    c. Resources & Tools
3. Ethics in genomic science and medicine - TBD

Code of Conduct

All graduate students are expected to adhere to the standards of behavior stated in The University of Connecticut Code of Conduct. http://policy.uconn.edu/2011/05/17/employee-code-of-conduct/

Scholarly Integrity

All graduate students are expected to display the highest level of integrity in their academic coursework and research. As defined in The Graduate Catalog of the University of Connecticut, scholarly integrity includes, but is not limited to the following:

- *Cheating involves dishonesty during a course, on an examination required for a particular degree, or at other times during graduate study, e.g., copying the work of another student;*
- *Plagiarism involves using another person's language, thoughts, data, ideas, expressions, or other original material without acknowledging the source. (adapted from Council of Writing Program Administrators, Defining and Avoiding Plagiarism: The WPA Statement on Best Practices, 2003);*
- *Distorted reporting involves "any omission or misrepresentation of the information necessary and sufficient to evaluate the validity and significance of research, at the level appropriate to the context in which the research is communicated" (D. Fanelli, Nature, 494:149; 2013);*
- *Fabrication or Falsification of Grades involves any form of falsification of coursework or tampering with grades, e.g., a student making unauthorized changes to her/his own grades or an instructor consciously misreporting grades of students;*
- *Misrepresentation involves taking an examination for another student, submitting work done by another individual as one's own, submitting the same work for evaluation in two or more courses without prior approval;*
- *Academic or Research Disruption involves unauthorized possession, use, or destruction of examinations, library materials, laboratory or research supplies or equipment, research data, notebooks, or computer files, or it might involve tampering with, sabotage of, or piracy of computer hardware, computer software, or network components.*
- *Aiding or Abetting involves actions that assist or encourage another individual to plan or commit any act of scholarly misconduct.*

Students not compiling with the standards of academic integrity are subject to sanctions, which may include dismissal from The Graduate School. The full description of Scholarly Integrity can be found in the Graduate School Catalog: http://gradcatalog.uconn.edu/grad-school-info/scholarly-integrity/

Services available to UConn Health graduate students:

Students experiencing personal difficulties during the course may utilize the following services. Please familiarize yourself with these offices and the services they provide.

- Student Mental Health Services: http://health.uconn.edu/student-affairs/health-and-wellness/student-mental-health-service/
- Office of Institutional Equity: http://equity.uconn.edu/

- UConn Ombuds Office: http://ombuds.uconn.edu/

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