

SYLLABUS

Q BIO 105: Introduction to Quantitative Biology Seminar

This course is a required course for students majoring in Quantitative Biology and can only be taken by Q BIO students.

Spring 2024

- Time and Location:** Tuesdays, 3:30-5:10 pm
RRI 101
(Reception with refreshments at 3:00 pm)
- Course Instructors:** Dr. Peter Calabrese (petercal@usc.edu); RRI 404B
Associate Professor of Quantitative and Computational Biology (Teaching), Director of Undergraduate Studies, Q BIO Major
- Dr. Remo Rohs (rohs@usc.edu); RRI 413H
Professor and Chair of Quantitative and Computational Biology
- Teaching Assistant:** Jesse Weller (wellerj@usc.edu); RRI 413L
Ph.D. Candidate in Physical Biology

Introduction:

This course is the introductory seminar for the Q BIO major. It is ideally taken as freshman but it can be taken after a student's transfer into the Q BIO program. The instructors will introduce the general field of Quantitative Biology, its definition and role within Biology, and its relationship with Chemistry, Computer Science, Engineering, Mathematics, Medicine, and Physics. The curriculum will include introductory lectures by the instructors, guest lectures, and discussions.

Schedule:

- 1/09 Dr. Peter Calabrese**
Associate Professor of Quantitative and Computational Biology (Teaching)
Introduction to neural networks
- 1/16 Dr. Hao Li**
CEO and Co-founder, Pinscreen, Inc., Associate Professor of Computer Vision, Mohamed bin Zayed University of Artificial Intelligence, Abu Dhabi, U.A.E. (former USC faculty)
Generative AI for human synthesis and world capture
- 1/23 Dr. Soheil Shams**
Founder and President, TESA Research, Inc., CIO Emeritus, Bionano Genomics, Inc.,
Founder and Former President of BioDiscovery, Inc. (USC alumnus)
Artificial Intelligence and bioinformatics – A 30-year personal journey
- 1/30 Dr. Helen Berman**
Professor (Research) of Quantitative and Computational Biology, Co-founder and Director Emerita, RCSB Protein Data Bank
Coevolution of structural biology and the Protein Data Bank

- 2/6 Dr. Yolanda Gil**
Professor (Research) of Computer Science and Spatial Sciences, Senior Director for Strategic Artificial Intelligence and Data Science Initiatives, Information Sciences Institute
A brief introduction to Artificial Intelligence
- 2/13 Dr. Giovanni Cacciamani**
Associate Professor of Research Urology and Radiology, Co-Director of the Artificial Intelligence Center for Surgical and Clinical Application in Urology
AI applications in healthcare and ethical considerations
- 2/20 Dr. Matthew Michelson**
CEO, Readout AI, Former President, The Mighty, Genesis AI (USC alumnus)
AI in healthcare: Some practical applications
- 2/27 Dr. Yan Liu**
Professor of Computer Science, Electrical and Computer Engineering, and Quantitative and Computational Biology, Director, Machine Learning Center
Deciphering neural networks through the lenses of feature interactions
- 3/5 Dr. Khalil Iskarous**
Associate Professor of Linguistics
(How) do transformers represent signal structure?
- 3/12 SPRING BREAK**
- 3/19 Dr. Aaron Smargon**
Postdoctoral Scholar, Cellular and Molecular Medicine, University of California San Diego
Programming RNA with molecular technologies
- 3/26 Dr. Matthew Pennell**
Associate Professor of Quantitative and Computational Biology and Biological Sciences
Using phylogenetic trees to address open problems in genetics
- 4/2 Dr. Julia Schwartzman**
Gabilan Assistant Professor of Biological Sciences – Marine and Environmental Biology
Bacterial collective behaviors and ecological function
- 4/9 Dr. Geoffrey Fudenberg**
Assistant Professor of Quantitative and Computational Biology
3D genome organization
- 4/16 Dr. Alexander Titus**
Principal Scientist, AI x Bio, USC Information Sciences Institute, Former Principal Director for Biotechnology, U.S. Department of Defense, Former VP, Colossal Biosciences
(1) Apocaloptimism: Quantitative biology's role in global policy, (2) The mammoth impact of quantitative biology on making de-extinction a reality
- 4/23 Dr. Charles McKenna**
Professor of Chemistry and Pharmacology and Pharmaceutical Sciences, Director, Center for Drug Discovery
Drug discovery, past and present – The Covid failure in context and the case for optimism

Weekly Reports (10 points each; 150 points total): Reports should be no more than one page in length with up to 500 words. Reports must be typed and submitted electronically via Blackboard. Late reports will receive a maximum of 5 points. There will be a total of 15 weekly reports. These reports will have two parts: (a) summary of the previous lecture, and (b) potential questions for this week's lecture. For part (a), you must state the name of the previous lecturer, the date and title of the lecture, and list the main points raised during the lecture and discuss the meaning of each. For part (b), you should research the current week's lecturer and topic and pose several potential questions. Reports are due the following week at lecture time.

Grading: Your final letter grade in this course will be based upon all of your written reports, participation and discussion. Since there are no exams in this course, active participation and attendance are important components. Unless you are sick or test positive for COVID-19, in-person attendance is required. If you feel sick, do not attend class but contact us as soon as possible and accommodations will be made. The grade will consist of 150 points for weekly reports. Participation and active discussion will be considered for the final grade.

Statement for Observance of Religious Holidays: USC's policy grants students excused absences from class to observe religious holidays: <http://orl.usc.edu/life/calendar/absences/> In this case, please contact your instructor in advance to agree on alternative course requirements.

Statement for Students with Disabilities: Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

Statement on Academic Integrity: USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. *Scampus*, the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A: Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: <http://www.usc.edu/student-affairs/SJACS/>.